171/6

Federation of Rhodesia and Nyasaland

REPORT

of the

SECRETARY

to the

FEDERAL MINISTER OF AGRICULTURE

For the Year ended 30th September, 1963

PRICE 10/6 PER COPY

PRINTED BY THE GOVERNMENT PRINTER, SALISBURY
1964

RAM
12 NOV 1964

G.P. & S. 13910—701—10-1-64.

REPORT OF THE ACTING SECRETARY TO THE FEDERAL MINISTER OF AGRICULTURE

(which includes the Economics and Marketing Branch, the Departments of Research and Specialist Services, Conservation and Extension and Veterinary Services)

FOR THE PERIOD 1st OCTOBER, 1962, TO 31st DECEMBER, 1963

Digitized by the Internet Archive
in 2025

https://archive.org/details/report-of-the-secretary-for-agriculture-southern-rhodesia_1964

CONTENTS

Page No.

Report of the Acting Secretary to the Federal Ministry of Agriculture 1

Economics and Marketing Report 15

Department of Research and Specialist Services . . 17
- Crop Production 21
- Animal Husbandry 23
- Dairying 28
- Poultry 35
- Pasture Research and Ecology 39
- Botany, Plant Pathology and Seed Services . . 45
- Chemistry and Soil Science 53
- Entomology 60
- Horticulture 67
- Agricultural Experiment Station, Salisbury . . 70
- Eastern Highlands Research Station, Melsetter . 75
- Gatooma Research Station 79
- Grasslands Research Station, Marandellas . . 86
- Henderson Research Station 89
- Matopos Research Station (including Nyamandhlovu and Tuli Stations 98
- Rhodes Inyanga Orchards 105
- Sabi Valley Experiment Station 111
- Gwebi Agricultural College 117
- Chibero Agricultural College 120

Department of Conservation and Extension . . . 125
- Appendices I to X 165

Department of Veterinary Services 179
- Veterinary Field Branch 181
- Veterinary Research Branch 192
- Tsetse and Trypanosomiasis Control Branch . . 203
- Appendices I to IV 223

REPORT OF THE ACTING SECRETARY TO THE FEDERAL MINISTER OF AGRICULTURE

GENERAL

THIS REPORT is the last to be issued by the Federal Ministry of Agriculture and covers the period commencing 1st October 1962 and ending 31st December 1963. As from the 1st January 1964, all responsibilities exercised by the Federal Government over the ten-year life of the Federation reverted to the Territorial Governments and the Federal Ministry of Agriculture ceased to exist. It will be noted that the reports for the three departments of Research and Specialist Services, Conservation and Extension and Veterinary Services cover the period ending on 30th November 1963 instead of 31st December 1963, since responsibility for their functions reverted to the Territorial Governments one month earlier.

The 1962/63 season was a difficult one. Many areas suffered from excessive rainfall and this, naturally, reduced production, particularly of tobacco and maize.

The original forecast of flue-cured tobacco production from the South-Western Area was 220,000,000 lb., which compares with the weight actually sold of 194,782,358 lb. and the previous year's sales of 230,792,771 lb. The average price of 41.62d. per lb. realized on the sales was the highest for 11 years but, welcome though this was, it has its dangers. Growers must not attempt to infer that a short crop will give satisfactory prices and that production should, therefore, be restricted. Such reasoning would be extremely dangerous. Further, high prices usually lead to a search for alternative sources of supply. The object must be to expand markets — not to tempt buyers to look elsewhere.

Estimation of maize deliveries is very much more difficult than the estimation of the tobacco crop. However, the original estimate of deliveries to the Grain Marketing Board was 4,787,000 bags, whereas at the time of writing the estimate has been revised to 3,872,000 bags. The effect of this, of course, is that the quantity which was estimated would be exported decreased substantially. Coupled with successful selling on the part of the Board, it was possible to increase the producer pay-out from 31s. 9d. a bag to 35s. 9d. a bag. It must be stressed that this increase was due solely to the size of the crop, and to the fact that the producer received a fixed sum of 40s. 8d. (inclusive of the cost of a new bag) for maize sold on the internal market. Producers should not assume that this price will be received for future crops and should continue to give the most careful consideration to other crops which might be grown on their farms with more profit to themselves.

Last year it was reported that a keen interest was developing in the production of crops alternative or additional to maize. This interest has continued and intensified. Cotton production in the Rhodesias has increased from 1,616,000 lb. seed-cotton in 1961/62 to 8,920,000 lb. in 1962/63. This crop is one of exceptional promise. The research work of the Gatooma Research Station is showing up in the field and one looks forward to yet further advances and to seeing cotton established as a major factor in the economy of all the Territories which comprised the Federation. Expansion in groundnuts has been impressive. Deliveries to the Grain Marketing Board during the 1962/63 intake year amounted to 513,406 bags, which compares with deliveries of 346,256 bags in the previous season. Exports of groundnuts from the Rhodesias took place for the first time for many years and amounted to some 21,000 tons, at an average price of £57 12s. per ton. It should be remembered that as an incentive measure the Federal Government had announced preplanting prices. Generally speaking, these have been above export realization, but below import parity. This policy has been successful in stimulating production and, without doubt, this development has also been accelerated by the decrease in the maize price.

One of the hard facts of life is that when production of any crop exceeds the requirements of the internal market, incentive producer prices cannot be sustained without support from public funds. This is extremely hard to provide in a young, developing country where well-justified demands for funds are numerous and, in aggregate, far beyond immediate resources. The result is inevitable — producer prices tend to fall as production increases beyond the local requirement. This position will be the more sharply demonstrated on a regional or territorial basis. Whilst it is easy to point to possible consequential and beneficial results — such as the widening of the internal market, the hard and unpalatable fact facing the producer is that his costs of production on average show no decrease. The rewards which should flow from more efficient management are all too often swallowed up by increasing costs which are beyond his control. His economic existence, which is so vital to any territory, depends on decreasing his costs of production per unit — be it a bag of maize, a pound of tobacco, or a gallon of milk. This can usually only be achieved by increased yields, and considerable efforts are being made by Government Research and Extension Services — and by the Rhodesia National Farmers' Union — to held the producer achieve this. This position has been demonstrated in the downward movement of the maize price and, to a lesser degree, in the decreasing groundnut price. One is aware of the difficulties in cushioning these trends through support measures which usually involve quite substantial calls on the public purse, but there are circumstances in which a government may well find it cannot afford not to give some support which may, on the face of it, seem to be expensive. Pricing arrangements of an incentive nature may be required to get a suitable crop established. These may involve losses which have to be written off at some stage. But even a high expenditure is fully justified if the development is achieved.

The soya bean is another crop for which the potential is good. The challenge is to get yields per acre up to a point where the crop becomes profitable in relation to other alternatives. As a generalization, at seven to eight bags per acre, the net return is equivalent to maize at 16 bags to the acre. The task is to achieve this at around the same cost, and strenuous research work is being directed to this end.

Mention must also be made of Burley tobacco. Production increased from 5,657,000 lb. in 1961/62 to 8,591,000 lb. in 1962/63. The market is there, and there is no doubt that it can be produced both in quantity and quality. The future for this crop is bright, but one cannot over-emphasize the importance of quality and continuity of supply if the market opportunity is to be efficiently exploited.

All Governments which comprised the Federation will, without doubt, give considerable attention to the agricultural sector. It is one thing to increase production. This is comparatively easy. But production in itself is of little avail without adequate marketing arrangements. This is a matter to which the Federal Government has been very much alive and it is an aspect to which Territorial Governments will have to give at least equal attention.

During the year the Commissions of Inquiry into the Maize and Small Grains Industry of Northern and Southern Rhodesia and into the Cattle Industry have submitted their reports. The Federal Government was in no position to consider these because it was soon to go out of existence, and it had no alternative but to refer them to the Territorial Governments for such action as they see fit.

In the international field there have been three developments of importance to all Territories of the Federation—

(a) Britain's application to join the European Economic Community failed;
(b) discussions opened on the General Agreement on Tariffs and Trade on measures for the liberalization of trade initiated by the United States (Kennedy Round);
(c) Britain is considering revising her import policies in regard to agricultural products — principally cereals and beef.

The Minister of Agriculture and the Under-Secretary (Economics and Marketing) were part of a Federal delegation to the Ministerial meeting of the Commonwealth Economic Committee, which took place in London in May 1963. The most vigorous representations were made at this meeting in connection with the prejudice this country could suffer if access to markets was restricted and if preferences enjoyed were eroded. Visits were also made to the First Secretary of State — the Minister responsible for Central African Affairs, the Minister of Agriculture and to senior officers in the British Ministry, to press home our points. Representations continued to be made right up to the end of the life of the Federal Government.

Early in 1963, considerable concern was felt at the price levels announced by the United States Credit Commodity Corporation for the sale of tobacco still held in stock from the 1955 and 1956 stocks. These prices appeared to us to be in the nature of 'bargain basement' sales. Accordingly, representations were made to the United States and assurances were received that our interest would not be overlooked. Subsequently a delegation, led by the Minister of Agriculture and including Mr. C. A. Murray (Federal Secretary for Agriculture), Mr. E. Jeffreys (President, Rhodesia Tobacco Association) and Mr. W. Margolis (TEPCORN Council), visited the United States for discussions. The outcome of these was as successful as could reasonably be expected. Whilst in America, Mr. Murray and Mr. Margolis also attended a meeting of the FAO World Freedom from Hunger Campaign.

On the 22nd July 1963 Mr. C. A. Murray, Secretary of this Ministry, was seconded to the Southern Rhodesia Government as Secretary for Agriculture, and Mr. R. A. Griffith was appointed as Acting Secretary in his place.

It was with sincere regret that we said goodbye to our Minister, the Hon. J. C. Graylin, who resigned his portfolio on the 31st August 1963. His energetic and tireless work for the agricultural industry has been widely acknowledged. His consideration and support for his staff endeared him to us all.

The Hon. J. A. Clark, Minister of Commerce and Industry, took over the agricultural portfolio until the final dissolution of the Ministry.

CROP PRODUCTION

TOBACCO

Despite a fall in production, due to seasonal factors, the tobacco crop continued to play a vital role within the agricultural sector. Production and sale of the various types of tobacco is shown in the table below:

SOUTH-WESTERN AREA

	Total Weight (1,000 lb.)	*No. of acres (1,000 acres)*	*Weight per acre (lb. per acre)*	*Total Weight (£1,000)*	*Average price per lb. (d. per lb.)*
Flue-cured	194,782	235	829	33,780	41.62
Burley	956	N.A.	—	—	—
Turkish	*1,061	N.A.	—	—	—

* Estimate.

NORTH-EASTERN AREA

	Total Weight (1,000 lb.)	*Total Receipts £1,000*	*Average Price per lb. (d. per lb.)*
Flue-cured	3,720	529	34.10
Burley	7,635	916	28.80
Southern Fire-cured	2,998	287	23.01
Northern Fire-cured	24,490	1,773	17.37
Total Fire-cured	27,488	2,060	17.98
Sun-cured	5,218	492	22.61
Turkish	*200	N.A.	N.A.

* Estimate

The season, in the main, was difficult and resulted in the bulk of the flue-cured tobacco being light in weight, with a consequent fall of some 20 per cent. over the previous year in yield per acre. The price of 41.62d. per lb. for the reduced crop was good and the final sales figure of £33,779,605 was a record gross income.

Tobacco from the Eastern Province of Northern Rhodesia was again sold on the Limbe floors. Production from this area showed a continuing downward trend.

The declarations of destination of flue-cured tobacco by buyers show the following allocation of the crop:

SOUTH-WESTERN AREA

	lb.	*per cent.*
United Kingdom	107,765,862	55.33
Australia	3,405,823	1.75
Republic of South Africa ...	3,070,602	1.57
Local Market	8,227,122	4.22
Other Markets	72,272,409	37.11
Unallocated	40,540	.02
		100.00

The buyers on the Limbe floors were, unfortunately, not able to declare the destination of the tobacco purchased.

The United Kingdom remained the principal market for Federal tobacco and purchases showed a marked increase from 94,000,000 lb. in 1962, to 108,000,000 lb.; the proportion of the crop on this market showed a rise from 41 per cent. to 55 per cent. With the reduced offerings of tobacco, purchases by other markets tended to fall although purchases by the Republic of South Africa showed an increase of some 1,000,000 lb. over 1962. Tobacco is sold in the Federation on completely free auctions and, with increasing competitive conditions prevailing on the world markets, the efforts of the Tobacco Export Promotion Council of Rhodesia and Nyasaland to develop old, and to find new, markets are vital to the continued prosperity of the industry. The Council continued its stirling work and members of the staff toured various parts of the world and did much to stimulate interest in the Federation's tobacco.

Indications are that the coming season's tobacco will, given a reasonable season, be a record one. The majority of tobacco growers are highly skilled and experienced in producing an excellent crop on the land, but often do not make the same success with the handling of the crop. It is essential that if a larger and better-quality tobacco crop is to be produced, farmers should ensure that they have the facilities to handle it.

Due to the initiative of TEPCORN the Third International CORESTA Conference and the First World Tobacco Trade Congress were held in Salisbury in March 1963. Both were successful and brought together leading personalities in the world's tobacco industry.

The Trade Congress passed a resolution in favour of investigating the setting up of an International Centre for the collection and dissemination of information relative to the world tobacco trade. This was followed up and the inaugural meeting was held in Paris in December 1963.

Interest in Burley production is strengthening. This is a crop of great promise and one to which our country is well suited. Without doubt, formal marketing arrangements for the crop will soon be necessary. Given quality, a reasonable level of production, and continuity of supply, our Burley will rapidly gain a place in the world market.

It is pleasing to record the promising development of Turkish tobaccos, particularly in the Matabeleland area. This crop also has a ready market and, as with Burley, formal marketing arrangements will also be necessary soon.

With the fragmentation of the Federation, the Central African Turkish Tobacco Association wound itself up at the end of November 1963.

MAIZE

The 1962/63 season was an unfavourable one for maize. Deliveries of the crop to the Grain Marketing Board were estimated as follows:

	Bags	*Acres*
European production, Southern Rhodesia	4,900,000	370,000
European production, Northern Rhodesia ...	900,000	75,000
	5,800,000	
Less: Farm retention	1,400,000	
	4,400,000	
Add: Deliveries of the African crop, Southern Rhodesia	700,000	
Deliveries of the African crop, Northern Rhodesia	300,000	
	5,400,000	

Following on the agreement made when the Maize Price Agreement was terminated last year, to the effect that if the Report of the Commission of Inquiry into the Maize and Small Grains Industry of Northern and Southern Rhodesia was submitted too late for it to have any effect on the pricing arrangements for the 1962/63 crop, the price would be fixed as if the Agreement had not been terminated, the producer price was calculated at 33s. 2d. per bag, and a price of 31s. 9d. per bag was, in fact, prescribed.

In September 1963 the position was reviewed and the price recalculated in the light of revised estimates. It was disclosed that the season was even more disappointing than originally thought. The decrease in deliveries which was then apparent meant a corresponding decrease in exports. Coupled with very successful export sales by the Board, the revised calculation gave a producer price of 37s. 5d. per bag. Because of the serious financial position of many maize producers, Government authorized an increase in the producer price of 4s. per bag.

Truning now to the accumulated deficit in the Maize Export Trading Equalization Account of £1,103,112 from previous years, the major portion of which related to the over-payment to producers on the 1961/62 maize intake, it will be recalled that the producer price for last year was fixed at 29s. 7d. per bag and Government paid a fixed subsidy of £1,050,000. A single Maize Trading Fund was set up into which this subsidy was paid, along with profits and losses on local and export trading in respect of the 1962/63 maize intake. Had a deficit arisen on the year's trading it was intended to add this to the deficit. On the other hand, any surplus would be offset against it. In the event the single Maize Trading Fund showed a surplus of £568,539 after fully repaying the deficit. This allowed supplementary payments totalling 1s. 10d. per bag to be made to producers, in terms of the Government regulation. This surplus was due in the main to a considerable decrease in deliveries resulting in a lower level of exports, together with an increase over the estimates of internal sales.

The Commission of Inquiry into the Maize and Small Grains Industry of Northern and Southern Rhodesia delivered its report late in April 1963. This was too late for it to have any influence on pricing policies and as the decision to dissolve the Federation had by then been taken, there was no alternative but to refer the report to the Territorial Governments for such action as they saw fit in the light of the policies they intend adopting.

An arrangement was also made, with the concurrence of the Territorial Governments, under which an assurance was given to maize producers regarding the method of price determination for the 1963/64 crop. Producers were assured—

(i) the consumer price, which must be considered against the general economic background at any time, will not be reduced at the expense of the producer;

(ii) the price paid to the producer for maize sold on the internal market will not be reduced below 37s. 3d. per bag (including the bag);

(iii) the producer price in relation to exported maize will continue to be estimated at realization.

In concurring with these assurances the Southern Rhodesia Government pointed out that it may be necessary for it to place a limitation of £300,000 on any subsidy provision.

It is evident that maize production, save in most disastrous circumstances, will always continue to outstrip internal demand. Much of the country is ideally suited for maize production and immense progress has been made in the production of high-yielding hybrid seed. Maize, in suitable areas and under good management, should be a profitable export crop even at world prices.

It is hoped that following on the Report of the Commission of Inquiry, policies will be evolved which will narrow the gap between producer pay-out and consumer price; that it will be possible to reduce the consumer price and that internal demand will be stimulated—together with the producer receiving a fair price for his product.

GROUNDNUTS

During the 1961/62 season there was evidence that groundnut production in the Rhodesias (outside the Eastern Province of Northern Rhodesia, which has for many years been an exporter of nuts) was, for the first time for many years, moving to a surplus over the requirements of the local market. There was a marked increase in production during the 1962/63 season and deliveries to the Grain Marketing Board were far in excess of local requirements. The major part of the increased production was in Southern Rhodesia. It is believed that this trend of increasing production resulted from the announcement of preplanting prices over the last three years as an incentive measure, and from propaganda to arouse interest in the crop. The lower maize prices of recent years have probably also caused the increase in the quantity of groundnuts delivered to the Grain Marketing Board. The following table indicates the level of groundnut production over the last four years ended 30th September 1962: the figures for the crop year ended 30th September 1963 are not yet available.

	Southern Rhodesia		*Northern Rhodesia*	
Crop Year ending 30th September	*European Production (1,000 bags)*	*African Sales (1,000 bags)*	*European Production (1,000 bags)*	*African Sales (1,000 bags)*
1959	8	52	1	74
1960	10	77	1	116
1961	18	180	2	150
1962	17	295	4	198

It is evident from the foregoing that the Rhodesias, particularly Southern Rhodesia, have now emerged as exporters of groundnuts. By the end of June 1963 the Grain Marketing Board had committed the export of 21,000 tons, at an average price equivalent to fractionally over 78s. per bag of 180 lb. f.o.r. Salisbury, and the indications are that this crop will make an increasing contribution to the export trade of the country.

In so far as marketing arrangements through the Grain Marketing Board are concerned, some years ago the Board instituted what was known as its 'S' scheme to encourage the production of high-quality nuts for sale to the confectionery trade in overseas markets. That scheme, under which the profits on sales were to be passed on to producers, failed. The crop was relatively 'new' to farmers and only very small deliveries of the type of nuts falling within the scheme were delivered to the Board. The 'S' scheme was followed by the Commercial Confectionery Groundnut Export Scheme under which merchants were permitted to contract with growers to export nuts on their own account. This latter scheme also appears to have failed, as merchants and producers have now accepted that the Grain Marketing Board should be the sole exporter of groundnuts, and employ merchants on an agency basis to select groundnuts to obtain the best realization on overseas export markets. In this way, it is expected that the Board's total intake of nuts would be marketed to best advantage on both local and export markets.

The warning must, however, be given that export prices fluctuate and, with an increasing production of groundnuts, it cannot be taken for granted that local consumer prices will be able to support indefinitely the level of more recent producer prices. This does not mean that the trend of increasing production should be reversed, but rather that producers should so improve their husbandry methods as to enable them to deliver to the Grain Marketing Board groundnuts of the type and quality required to fetch maximum prices on the world markets.

MUNGA AND KAFFIRCORN

These two crops continued under control and the producer prices and selling prices for the 1962/63 crop are shown in the following table:

	Producer Price per bag	*Selling Price per bag*
(a) Munga	29s. *(Class AS)*	35s. *(Class AS)*
(b) Kaffircorn	30s. *(Class A)*	35s. *(Class AS)*

Munga.—Deliveries of munga have been erratic as the table shows:

Intake Year (May-April)	*Southern Rhodesia*	*Northern Rhodesia*	*Total*
1956-57	141,348	—	141,349
1957-58	49,020	—	49,020
1958-59	72,722	20	72,742
1959-60	44,140	7	44,147
1960-61	15,460	—	15,460
1961-62	103,382	99	103,981
1962-63	48,667	18	48,685

There seems to be a good case for the removal of this crop from control, particularly as at present export prospects are poor. An opportunity for export occurred in South Africa, and advantage was taken of this. However, it was a rather fortuitous market and it remains to be seen if it can be sustained.

Kaffircorn.—To date deliveries of kaffircorn have not posed a serious over-supply position but this is a situation which can very easily arise. The principal market is among maltsters and it is not an unlimited one.

There is an export market for kaffircorn but exports would have to be of a consistent quality. The price would be materially below that for maize. To exploit this market profitably, increased yields per acre must be achieved and it is clear that acceptance standards will also need to be more stringent than they are at present.

COTTON

Production of this crop in the Rhodesias showed a substantial increase during the 1962/63 season, and present indications are that the past deterrents to the production of seed-cotton have been largely overcome.

Provided pest control can be maintained, together with a reasonable producer price level, production should continue to expand. Production of seed-cotton during recent years has been:

Crop Year ending 30th September	*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*	
	European (1,000 lb.)	*African (1,000 lb.)*	*European (1,000 lb.)*	*African (1,000 lb.)*	*European (1,000 lb.)*	*African (1,000 lb.)*
1959	943	146	17	—	2,152	19,368
1960	1,715	260	23	—	2,102	25,030
1961	2,528	456	47	47	2,078	23,848
1962	879	407	88	242	38,060	
1963 (Est.)	8,306	998	639	545	23,000	

Research into improved cotton strains and pest control measures continued and the expansion of the crop is due to the successful efforts of the research workers in these fields. Marketing of the crop was again undertaken by the Grain Marketing Board and to assist in handling of the increased crop a Cotton Committee was set up. In addition, regulations whereby producers are now required to furnish acreage returns by the 31st December each year were introduced in November 1962 and were of assistance to the Board in ensuring orderly marketing.

Ginning operations on the crop were carried out by Rhodesian Spinners Ltd., under the agreement between this concern, Government and the Grain Marketing Board. However, it was apparent that with the prospect of much larger seed-cotton crops the available ginning capacity would be inadequate and, consequently, arrangements were made for the installation of further ginning capacity at Gatooma.

The producer prices for cotton were as follows:

CLASS A	8½d. per lb.
B	7d. per lb.
C	5d. per lb.

Agricultural Marketing Council has recommended that a preplanting price be announced for the 1963/64 crop of 8d. per lb. of seed-cotton. No prices were recommended for Class B and Class C and the position is to be reviewed in March 1964.

In recommending the price of 8d., Marketing Council also suggested the introduction of a General Cotton Trading Reserve into which any profits should be paid. These funds would be used for price stabilization and, if need be, for the development of facilities for handling and marketing the crop.

Wheat

Encouraging progress has been made in the development of high-yielding varieties suitable for local conditions. Considerable progress has been made towards overcoming the problem of rust and the main outstanding problem in summer wheat production now is that of the control of weeds.

There is in existence an informal pricing arrangement with the milling industry, under which local production is taken up at a price of 60s. per bag. This compares favourably with the landed price of imported wheat of 58s. per bag.

Imports in 1962 amounted in value to £2,000,473. Clearly, it would be in the national interest if production could be increased to meet a greater part of this import.

Barley

Production has not increased to any extent. The market is provided by the brewing industry and is limited by its malting capacity. Efforts have been made, and will continue to be made, to persuade the brewers to increase local malting capacity.

Producers can contract to supply the brewing industry and the prices offered are at present:

Grade 1	50s. 0d.	per 150 lb. bag f.o.r sender's station.
Grade 2	47s. 6d.	
Grade 3	45s. 0d.	

Coffee

Interest in coffee production has been maintained and new plantings are taking place in the Eastern Districts of Southern Rhodesia. During the year the Ministry appointed a coffee specialist to assist growers in overcoming production and processing problems. The crop is showing great promise and should prove a most useful addition to the economy, but growers are advised to concentrate on the arabica variety and to pay particular attention to quality.

Soya Beans

There is a growing interest in the production of soya beans, particularly in the lowveld. There is an enormous market, especially in the Far East, which can be exploited. Broadly the problem is to attain an average yield per acre of not less than about eight bags. It is at this point that production for export becomes profitable.

The Ministry is putting in a strong effort to establish varieties and cultural practices suitable to the country's ecological conditions.

The Agricultural Marketing Council recommended that the Grain Marketing Board should act as residual buyer of soya beans at a prescribed price. The Federal Government accepted this, but referred the matter to the Territorial Governments, as it was clear that implementation of the recommendation would fall to them. The Southern Rhodesia Government did, in fact, accept it. The price offered was 45s. per bag, adjusted for transport differentials for each intake point.

SUNFLOWER

Local expressors continued to show interest in sunflowers and offered a price of 30s. per bag.

CASTOR BEANS

Local demand is good and production falls short of satisfying it. Prices payable over the last three years have been:

	Per bag		
	Initial	*Supplementary*	*Total*
1960-61	42s.	37s.	79s.
1961-62	42s.	20s.	62s.
1962-63	42s.	—	42s.

The drop in the last year was due to a fall in the world price. However, the position has since improved, and for the 1963/64 crop a guaranteed price of 62s. 6d. per bag has been announced, and this price, together with the availability of improved seed, should do much to encourage local production.

TEA

Plantings in the Eastern Districts continued to expand and, with young bushes coming into production, the quantity of tea available for the local and export markets has increased. Satisfactory prices were received on the London Market.

ONIONS

With the introduction of improved varieties onion production continues to expand, and in addition the harvesting season has been extended. Protection of the local growers is afforded by import control during the period August to January and by a tariff duty in February. The period of protection may require revision, as increased local supplies are becoming available during other months of the year.

POTATOES

During the period under review no imports of ware potatoes were made into Southern Rhodesia, but imports amounting to some 900,000 lb., roughly 50 per cent. of the previous year's imports, were made into Northern Rhodesia during May and June. Ample local supplies were available during September and October, and exports were made to the Congo.

As regards seed-potatoes, imports were restricted to supplies of specialized varieties.

RICE

Supplies of rice from Nyasaland once again failed to materialize in any quantity and, consequently, permits had to be issued for imports representing over 80 per cent. of Northern and Southern Rhodesia requirements.

Delay in the supply of information regarding the local crop was again noted and merchants, who have to place orders overseas well in advance where at times placed in a difficult position to meet local requirements.

FRUIT

Deciduous fruit production, which is centred mainly in the Eastern Districts, continued to expand and marketing of the bulk of the fruit was undertaken by the Fruit Pool. Continued trial shipments of fresh fruit by air to the United Kingdom were carried out, and the results showed that this outlet was promising, especially for peaches and avocado pears. In October 1963 a visit to London was made by two officials of the Ministry to explore the possibilities of exports by air.

Citrus production, especially in the lowveld of Southern Rhodesia, showed an increase and greater exports were made to the United Kingdom. Import control, which had been introduced in 1962, assisted producers to find additional outlets, at reasonable prices, in the local market.

Import control on bananas was instituted during 1963. This has assisted local producers and also fostered arrangements between producers, importers and ripeners.

Grape production continues to find favour, and whilst the main outlet is in the sale of table grapes, experimental work on the production of wines from local grapes has increased. Prospects for this infant industry appear good.

One cannot overstress the importance of quality and correct presentation of produce, at prices which do not deter consumption. Far too many complaints are received in the Ministry about the condition of fruit reaching merchants. The internal market is a protected one, but it was never the intention that it should be protected for poor-quality produce. Many producers are growing good-quality fruits; this will continue, without doubt, but there is room for substantial improvement in grading, packing and general presentation.

SUGAR

Sugar production continued to expand and supplies are now sufficient to meet local requirements. Although the Federation was unsuccessful in obtaining any quota under the Commonwealth Sugar Agreement, exports at favourable prices were made during the period. The report of the Commission of Inquiry into the Sugar Industry was published and the recommendations were considered. Agreement was reached between the sugar estates and refiners on supplies of raw sugar, and an association representative of all interested parties was formed. On the question of the supply of rebated sugar to industries which process agricultural products, it has been agreed that these supplies will still be made available at present rebated prices and that consideration for the supply of rebated sugar to new industries would be given in the light of prevailing circumstances. Control over existing producers will now be based on a system of market sharing, both internal and external, exercised through the new association.

VEGETABLES

Fresh vegetable imports during 1962 were valued at £38,934, which showed an increase of some £7,000 over 1961. Imports until August 1963 amounted to £26,700. The greatest proportion of these imports was consigned to Bulawayo and to Northern Rhodesia. Changes in the pattern of imports are largely dependent on seasonal factors, but it is evident that the continuation of 1d. per lb. duty on fresh vegetable imports has done much to encourage local production. Early in 1963 an import duty of 1s. per lb. was imposed on fresh mushrooms as a further measure to protect local producers against imports at unreasonably low prices.

Exports of dehydrated vegetables during 1962 were valued at £236,000 and, for the first eight months of 1963, at £103,000. The main markets are the United Kingdom and Holland. Fresh vegetable exports were made to neighbouring territories. Detailed investigations into the possibilities of air-freighting fresh produce to the United Kingdom and other European markets are in hand, with the close co-operation of airlines and international commercial trading companies.

PASTORAL PRODUCTION

CATTLE

The cattle industry has continued its development. The rate of growth is illustrated in the following table:

CATTLE HOLDINGS IN THE FEDERATION

(thousand head)

	Southern Rhodesia		*Northern Rhodesia*		*Nyasaland*		*Federal Total*	
	European Owned	*African Owned*	*European Owned*	*African Owned*	*European Owned*	*African Owned*	*European Owned*	*African Owned*
1958	1,506	2,074	167	917	14	329	1,687	3,320
1959	1,553	2,093	179	955	15	342	1,747	3,384
1960	1,552	1,954	197	1,006	17	340	1,766	3,310
1961	1,599	1,988	213	1,070	15	359	1,827	3,417
1962	1,626	2,091	215	1,056	15	365	1,856	3,512

In Southern Rhodesia, the cattle population decreased during 1960 due to the severe drought conditions. It is gratifying to see that by 1962 the total cattle population had risen to its highest figure ever.

The efficiency and value of the cattle industry is, of course, not based merely on cattle holdings from year to year, but also on the annual off-take of cattle for commercial slaughter. The annual rate of off-take during the last five years is shown in the following table:

CATTLE SLAUGHTERING IN THE FEDERATION

(Excluding slaughtering in the African Reserves for Subsistence)

(head)

	Southern Rhodesia	*Northern Rhodesia*	*Nyasaland*	*Federal Total*
1958	282,030	40,366	29,149	351,545
1959	345,894	50,359	26,238	422,491
1960	357,395	58,961	29,445	445,801
1961	341,753	76,155	32,766	450,674
1962	352,110	73,965	35,853	461,928

Assuming that the number of cattle slaughtered for subsistence in African areas was more or less at a constant annual figure, the above tables indicate that cattle holdings are generally increasing side by side with an increasing annual slaughter off-take. These figures indicate encouraging trends. The following table shows the grade comparisons of cattle produced in Southern Rhodesia and Northern Rhodesia and delivered to the Cold Storage Commission for slaughter.

CATTLE SLAUGHTERINGS COVERED BY THE CATTLE PRICES AGREEMENT BETWEEN THE FEDERAL GOVERNMENT AND THE RHODESIA NATIONAL FARMERS' UNION

Grade	*No. of Head of Slaughter During each Price Year Ender 31st March*			*Annual Average C.D.W. per Head (in lbs.)*		
	1961	1962	1963	1961	1962	1963
Southern Rhodesia						
Rhodesia's Best	4,746	7,113	9,316	556	553	567
Imperial	13,229	17,355	13,342	548	545	557
Standard "A"	45,782	63,775	60,911	503	498	504
G.A.Q.	67,247	80,030	79,005	465	463	461
F.A.Q.	40,252	35,923	44,226	402	410	401
Compound	38,418	20,315	30,547	367	376	381
Inferior	11,336	3,396	7,022	296	302	308
TOTALS	221,010	227,907	244,369	442	463	456
Northern Rhodesia						
Rhodesia's Best	313	351	509	557	560	576
Imperial	517	1,371	2,772	562	560	568
Standard "A"	3,225	4,485	10,355	506	522	522
G.A.Q.	3,695	5,766	10,182	475	470	476
F.A.Q.	2,760	7,473	10,512	415	420	427
Compound	2,169	9,316	11,390	369	390	391
Inferior	854	3,761	4,568	275	351	325
TOTALS	13,533	32,523	50,288	446	436	448

NOTE: The weighted annual average prices paid to producers were as follows:

	per 100 lb. C.D.W.		
	1961	*1962*	*1963*
Southern Rhodesia	121/-	126/9	123/1
Northern Rhodesia	125/7	123/10	123/7
Total Average	121/3	126/6	123/2

The prescribed weekly prices were on a uniform basis in both Territories. The difference between the annual average prices paid in Southern Rhodesia and Northern Rhodesia was due to the grade and seasonal pattern of deliveries in each Territory. The above table also indicates the important played by the Cold Storage Commission as the main commercial outlet for slaughter cattle.

It is, of course, well known that the Cold Storage Commission operated at a loss of £310,093 during its financial year ended 30th June 1961 and at a profit of £39,801 during its financial year ended 30th June 1962. Although audited figures are not yet available for the financial year ended 30th June 1963, it is expected that the Commission's operating results during this year will show a profit of the order of £200,000. This favourable position was attributable, at least in part, to the more recent producer price schedules which encouraged the delivery of high-grade cattle to the Commission throughout the whole year to correct the previous trend of the bulk of high grades being delivered during the high-price months of September to November. During this past year, there was a noticeable change in the seasonal pattern of deliveries to the Commission. For example, in the February to May period, the number of cattle slaughtered by the Commission was 92,034 head, during 1961/62, but rose to 114,349 head during 1962/63. This represents a highly desirable change in the pattern of slaughter, as it permits a large part of the exportable beef surplus to become available during the period of low producer prices when overseas prices are normally most favourable. In this way the annual profitability of beef exports is substantially assisted, which therefore also assists the rational production of slaughter cattle on a national basis.

The Cold Storage Commission's annual reports give details of the volume and value of its export trade. The United Kingdom remains the largest market, and favourable reports on meat consigned to the Smithfield Market continue to be received. The South Africa Perishable Products Marketing Board continued to give the fullest co-operation and consideration to the Federation in the allocation of refrigerated shipping space and this is gratefully acknowledged.

Until now, the exportable surplus of beef has been derived in Southern Rhodesia and it is anticipated that this position will continue for some years. It is, therefore, of vital importance to Southern Rhodesia, after the dissolution of the Federation, that it continues to have shipping space available for its beef exports and, in fact, that it has overseas export markets available in future. It is, therefore, essential to maintain and improve upon, wherever possible, the present high standards of veterinary control and the present high standards of hygiene in the Cold Storage Commission's abattoirs and cold storage works. Following the visit of an Italian veterinary expert to study control measures in Southern Rhodesia at first hand, the Italian market has, once again, been opened to beef imports from Southern Rhodesia. More recently, a senior veterinarian of the Ministry of Agriculture of the United Kingdom visited the Federation, and a visit to Southern Rhodesia in 1964 by a German veterinarian is expected.

During the year the Federal Government appointed a Commission of Inquiry into the Cattle Industry, under the chairmanship of Professor O. P. F. Horwood, with Messrs. W. E. Cave, K. M. Lewis and J. R. Corry as members. This Commission of Inquiry has submitted its report and this has been referred to the Territorial Governments because the Federal Government was in no position to implement any of its recommendations. Discussions also took place with the Bechuanaland Administration on the operation of the Bechuanaland Trade Agreement, which includes provisions for cattle and beef imports into the Federation. Those discussions did much to ensure the smoother operation of the Agreement.

As a result of the break-up of the Federation, the Farmers' Marketing Board of Limbe has purchased the Cold Storage Commission's undertakings in Nyasaland, the date of the transaction being the 1st December 1963. The Cold Storage Commission's undertakings in Southern Rhodesia and Northern Rhodesia will be taken over by statutory marketing bodies in each Territory, with effect from the date of the dissolution of the Federation. It can therefore be confidently expected that the valuable services rendered to the cattle industry by the Cold Storage Commission will be continued by its successor bodies in each Territory.

The present Cattle Prices Agreement between the Federal Government and the Rhodesia National Farmers' Union will terminate on 31st March 1964. The Southern Rhodesia Government has approved that the producer prices schedule, prescribed by the Federal Government for the 12 months ended 31st March 1964 will continue in Southern Rhodesia for the succeeding 12 months, i.e. until 31st March 1965. The Northern Rhodesia Government has not, at the date of writing, determined the cattle prices which will apply in Northern Rhodesia after the 31st March 1964.

This part of the report would not be complete without a comment that world prices for hides continue to fall. These prices may have an impact on future producer prices for cattle. For example, if the 1961/62 prices of hides had applied during 1962/63, the Cold Storage Commission's revenue during the latter year from sales of hides of its Southern Rhodesia and Northern Rhodesia branches would have been increased by approximately £60,000.

PIGS

The Federation continued to be more than self-sufficient in pork products, and a considerable increase in exports took place during 1962. As overseas prices are not attractive Colcom Products Central Co-operative Ltd., which buys all pigs offered to it at minimum prices set by Government, found it necessary to adjust prices five times over the period with the aim of moving production towards local requirements. On present trends, slaughtering during 1963 will exceed the figure for 1962.

During the period a new Colcom factory came into operation in Northern Rhodesia.

DAIRY

Deliveries of milk to the Dairy Marketing Board in Southern Rhodesia for the 12 months to the 30th September 1963 continued to increase but not to the same extent as in previous years. Intake rose by 236,000 gallons, reaching a level of 15,500,000 gallons. In Northern Rhodesia intake rose by 174,000 gallons, and totalled 3,100,000 gallons. Whole-milk sales in Southern Rhodesia showed a drop of 118,000 gallons, whilst in Northern Rhodesia, sales increased by 46,000 gallons.

The system of differential prices continued to operate in both Southern and Northern Rhodesia. There was no change in the basic guaranteed prices paid to producer-wholesalers, but the levy applicable to producer-retailer selling is prescribed areas in Southern Rhodesia was extended to cover producer-retailers in certain prescribed areas of Northern Rhodesia. For one year, however, ending 31st January 1964, the rate of levy in Northern Rhodesia will be ½d. per pint and thereafter be 1d. per pint. There was no change in the retail prices of milk in the two Territories. The guaranteed producer prices for whole-milk sales remained at approximately 46.5d. per gallon, but the Pool Price System brought the actual average produce price for milk in Southern Rhodesia to approximately 33d. per gallon, and in Northern Rhodesia to approximately 37d. per gallon. In addition, producers in both Territories qualified for a quality premium which averaged approximately 1½d. per gallon over all deliveries.

The decrease in pay-out has resulted from an increasing quantity of milk coming forward whilst whole-milk sales have tended to fall. The trend of whole-milk production and sales over the past few years is as shown below:

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

	Intake (1,000 gals.)	*Whole Milk Sales (1,000 gals.)*	*Surplus (1,000 gals.)*	*Surplus as a percentage of intake*
1959-60	13,815	7,178	6,637	48.0
1960-61	14,307	7,162	7,145	49.9
1961-62	15,236	7,154	8,082	53.0
1962-63	15,472	7,036	8,436	54.5

DAIRY MARKETING BOARD: NORTHERN RHODESIA

	Intake (1,000 gals.)	*Whole Milk Sales (1,000 gals.)*	*Surplus (1,000 gals.)*	*Surplus as a percentage of intake*
1959-60	3,076	1,711	1,365	44.4
1960-61	2,766	1,688	1,078	39.0
1961-62	2,829	1,800	1,029	36.4
1962-63	3,131	1,846	1,285	41.0

Note: The 'separation on farm' scheme operated during 1960/61 and 1961/62. It is estimated that this reduced actual intake by 265,000 and 128,000 gallons respectively.

Notice of termination of the Milk Price Agreement has now been made and the Agreement will expire on the 31st March 1965.

The Dairy Marketing Board continued to co-ordinate the operations of the dairy industry in the Rhodesias under the provisions of the Dairy Produce Marketing and Levy Act. The Butter Imports Advisory Committee was discontinued during the period and the Dairy Marketing Board, which was the sole importer of butter, took over its activities.

The recommendations of the Commission of Inquiry into the Dairy Industry were further considered by Government, the Rhodesia National Farmers' Union and the Dairy Marketing Board. The report of that Commission, in the main, confirmed Government's milk policy. Possibly its major innovation was the recommendation to introduce Inter-centre Price Differentials, but up to the present no decision has been taken on this proposal.

The general position in the dairy industry gives cause for concern. Basically, the problem is that whole-milk sales are not increasing and a greater proportion of milk production is used in manufacturing dairy products. This milk realizes approximately 21d. per gallon, and the net effect is a drop in the overall price per gallon received by the producer. A great deal of attention is being given to the problem but it is an extremely difficult one to resolve.

SHEEP

Local production continues to fall well short of internal market requirements, and estimated Federal production of mutton and lamb for the 12 months to the 30th September 1962 was 1,699,000 lb., whilst imports amounted during 1962 to 3,312,000 lb. There is, therefore, considerable scope for the expansion of local production. Imports continued to be restricted under quota arrangements and this protection should provide an impetus to local production. In addition, the Cold Storage Commission provided a ready market for mutton and lamb at prices based on grades introduced in May 1963. Slaughterings by the Commission of sheep and lambs over the 12 months ended July 1963 numbered 16,688 with a cold dressed weight of 522,758 lb.

POULTRY

The poultry industry continued to be able to supply local requirements, and exports were made to neighbouring territories. The Poultry Imports Advisory

Committee, set up in the previous year, continued to meet to discuss various aspects of the industry and also to advise on importations of specialized breeding stock and hatching eggs.

Egg supplies were adequate throughout the period and a noticeable downward trend in prices took place.

Local supplies of turkeys, especially over the Christmas period, were adequate but care should be taken by producers that their birds are of the quality and size which meet the requirements of the trade.

During the period, a Report on an Investigation into the Poultry Industry of the Rhodesias was published. Unfortunately, due to a poor response and to inadequate records of most producers, the information on the economic aspects of the industry is not as full as could have been hoped for, but the report does give an account of the development of the industry, which may provide a useful guide in considering future policy.

DISSOLUTION OF THE FEDERATION

The decision to dissolve the Federation has, of course, involved the dismantling of all Federal departments and statutory boards. Obviously, it has been necessary for the Territorial Governments to equip themselves with the necessary legislative powers to carry on the services hitherto falling to the Federal Government and to take over the staff required to administer them. These have been massive and complicated tasks, and this Ministry did its utmost to give every possible assistance.

It was decided that all functions, other than marketing, should revert to the Territorial Governments on the 1st December 1963, and that the marketing functions, including the statutory boards, should revert on the 1st January 1964. Accordingly, Federal departments and boards within the ambit of this Ministry ceased to exist with effect from the dates shown below and the Territorial Governments assumed full responsibility:

1st December 1963

- Research and Specialist Services
- Conservation and Extension
- Veterinary Services (including Tsetse and Trypanosomiasis)
- Tobacco Research Board.

1st January 1964

- Economics and Marketing Branch
- Cold Storage Commission
- Grain Marketing Board
- Dairy Marketing Board
- Tobacco Export Promotion Council of Rhodesia and Nyasaland
- South-Western Tobacco Marketing Board
- North-Eastern Tobacco Marketing Board
- Pig Industry Board.

Because of the transfer of functions on these different dates, it will be noted that sections of this report which follow cover different periods ending on 30th November and 31st December 1963, respectively.

It should be noted that the Federal Government exercised limited responsibility in the agricultural field in Nyasaland. What it did exercise lay in the marketing field, and then only in respect of tobacco and beef. Two marketing boards under Federal control operated in Nyasaland, viz, the North-Eastern Tobacco Marketing Board and the Cold Storage Commission. TEPCORN, of course, included Nyasaland tobaccos in its sales promotion activities.

The Cold Storage Commission Works in Blantyre were disposed of to the Nyasaland Farmers' Marketing Board by way of a cash sale prior to the dissolution of the Federal Cold Storage Commission.

One may perhaps be forgiven for looking back and attempting to assess the progress made by the agricultural industry over the years that Federation existed. Obviously, it cannot be claimed that all progress was due to the act of Federation because this would pre-suppose that the industry in each Territory would otherwise have remained static. Of course, this would not have been the case. But one can point to what in fact happened:

	1954 *£ million*	*1962* *£ million*	*Increase +* *Decrease −* *£ million*
Gross value of agricultural production at market prices	91.1	136.4	45.3+
Value of agricultural exports	31.9	58.5	26.6+
Value of agricultural imports excluding wheat . .	13.2	11.9	1.3−
Income tax derived from agriculture	1.4	3.4	2.0+

The effect of seasonal factors must be taken into account, as they can affect the state of the industry more than anything else. Nevertheless, the Federal Government was able to provide research and advisory services of a high standard —higher, it is believed, than any one Territory could have provided on its own. It was also able to protect the whole of the Federal area as the market for Federal production. It provided formal marketing arrangements, including price guarantees, for major crops. These measures, applicable over a wider basis than a single Territory, were, in my opinion, of the utmost significance in the development achieved in the industry.

It is pleasing to report that throughout the period of Federation, there was, at the professional and technical level, an excellent degree of co-operation and liaison between the Federal and Territorial Ministries. One hopes that this will continue in the future.

I wish to place on record this Ministry's sincere appreciation of the notable part played throughout by producer organizations. There have been at times disagreements but these have always been resolved. This has been due in no small way to the straightforward and statesman-like way in which these bodies have approached negotiations with Government.

I would also like to acknowledge with gratitude the part played by members and management of all the statutory boards and the assistance rendered by all those who have given so generously of their time and energies in serving on a multitude of advisory committees. The agricultural industry has many problems and the manner in which so many have helped has been heartening.

Finally, I wish to place on record my appreciation of the work of the staff of this Ministry. The year has been particularly difficult, beset as it was with problems of dissolution. Individual officers were faced with serious personal problems regarding their future careers. Worrying though this was to many, all continued to give of their best right up to the end.

R. A. GRIFFITH,
Acting Secretary for Agriculture.

Economics and Marketing Report for the Period 1st October, 1962 to 31st December, 1963

THE PERIOD UNDER REVIEW saw the ending of the Federation as such and a programme of work was initiated to assist in the reversion to the constituent territories of the functions previously undertaken by the Federal Government. The Branch was involved in the activities of the break-up committees and in September the Chief Agricultural Economist was lent to the Southern Rhodesia Government to assist its Ministry of Agriculture in the resumption of functions by that Government.

Functional changes within the Branch noted in the previous year's report continued and with the filling of vacancies at both the senior and junior levels an increase in investigations on the economic aspects of agricultural policy and field surveys was possible. However, the Branch still did not have its full complement of staff and there remained a vacancy at the junior level during the period.

The Branch continued its function of advising the Secretary and Minister on all aspects of agricultural development and marketing policy. In addition, it was required to assist two Commissions of Inquiry — the Maize and Small Grains Industry and the Cattle Industry—which sat and reported during the period. The office of the Secretary to these Commissions was undertaken by the Chief Agricultural Economist and the Senior Agricultural Economist respectively, and resulted in the secondment of these senior officers for the periods of the inquiries. Effectively during the period under review the Branch was without the services of one of its two senior members for 75 per cent. of the time.

The Branch continued the cost of production survey on Virginia flue-cured tobacco on behalf of the RTA, which is bearing the cost of this investigation. The Branch continued to assist the Department of Conservation and Extension with farm management advisory work, and in addition to the one senior professional officer on secondment, two further professional officers were seconded for the purpose. Other members of the Branch attended field-days organized by the Department.

The Chief Agricultural Economist continued to be the Registrar of Co-operative Companies. It is gratifying to report that continued interest was shown in the formation of agricultural supply co-operatives, resulting in two new co-operatives coming into existence during the period. One small supply co-operative ceased operations during the period.

As part of the Ministry's continued interest on the international front, the Chief Agricultural Economist attended the Food and Agricultural Committee on Commodity Problems in Rome. In addition the Senior Agricultural Economist attended as a member of a Federal team the Second FAO Regional Conference for Africa in Tunis. Unfortunately, this conference was not a success, due to the refusal of many African states to participate with South Africa present. Another senior officer of the Branch attended a five-month course on Agricultural Development Planning, held in Holland and Italy, under the auspices of FAO, and a short visit was made to England by an officer to investigate the market potential for fresh fruit and vegetables.

The Branch was responsible for the preparation of the Ministry's evidence for the Agricultural Marketing Council at which the Chief Agricultural Economist, or his deputy, attended all meetings of the Council as the Federal Government's observer. In addition to the Agricultural Marketing Council, the Chief Agricultural Economist or members of the Branch's staff served on the following committees: Federal Standing Committee on Agricultural Production (one as member, and one as secretary); the Sabi Development Committee; the Sabi Development Farm Advisory Committee; the Trade Agreements Working Party; the Rail Traffic Estimates Committee; the Beira Port Traffic Advisory Committee, and departmental committees covering aspects of farm credit, the dairy industry and the prospects for alternative crops to maize; on the Industrial Tariff Committee when agricultural matters were discussed; the Ministry's Show Committee, and the Farm Management Committee of the Rhodesia National Farmers' Union.

Members of the Branch lectured at Gwebi Agricultural College, at a short course for young farmers on labour and management, held under the auspices of the Natural Resources Board, and at various courses in farm management organized by the Department of Conservation and Extension. Liaison between the Branch and the new farm management section of the Rhodesia National Farmers'

Union was initiated. The Branch continued to prepare monthly marketing reports on prices and market conditions, and also information on prices of fruit and vegetables bi-weekly for the press and radio.

The Branch maintained a full programme of inquiries into costs of production and farm management problems during the year.

Tobacco Costs Survey — This survey is being carried out for the RTA. An initial report covering the results obtained from 117 farmers for the 1961/62 season was published in May 1963. Work is in progress on the report for the 1962/63 season and will cover results obtained from some 300 farms.

Milk Costs Survey — The final report covering the three years of the survey was published.

Cattle Costs Survey — The results of the third year of this survey were collected and a final report covering the three years is in the course of preparation.

Maize Costs Survey — The results for the first year of the survey were collected and a report should be published early in 1964.

Farm Management Survey — Work continued on the tabulation of data. The financial results obtained from a sample of fruit and vegetable farms in the Eastern Districts over three years were completed.

Poultry Survey — The report on a study of the poultry industry in Northern and Southern Rhodesia was published.

Reports were also published during the period covering groundnuts, soya beans and castor seed.

To all farmers who have co-operated, completely voluntarily, in these surveys, the Branch is indebted. Their assistance has been invaluable and it is hoped that their co-operation will continue in the future.

The three economists in the Department of Conservation and Extension are developing a farm management advisory service within the framework of that Department.

The Branch maintained its office in Lusaka, though no officer was permanently stationed there. Frequent visits were made by senior staff, and liaison with the Northern Rhodesia Government, Federal Departments and others continued.

L. URIBE,
Chief Agricultural Economist.

Department of Research and Specialist Services Report for the Period from 1st October, 1962 to 30th November, 1963

GENERAL

THE END OF the period under review marks a critical point in the history of Central Africa and a significant milestone in the development of this Department. From now on the greater proportion of the Department will become an integral part of a Southern Rhodesia Ministry of Agriculture, which for the first time will concern itself with agriculture as a whole, both European and African. A much smaller number of officers from Research and Specialist Services will join the Northern Rhodesia Ministry of Agriculture. The closing of the chapter marks, too, the end of a particular phase of growth and development, a phase during which, I think, it may justly be said that this Department acquired the assurance and the maturity which the experience, the training and the quality of its staff had made sooner or later inevitable.

It can be said with pride that, although so grave and momentous a transitional period as that we have recently passed through was bound to be clouded and darkened at times by uncertainties and doubts, all officers of the Department continued with their work and with the planning of future work exactly as they had always done. And, almost without exception, they have elected to continue with their important work in this part of Africa.

In many fields of research and investigation the Department has achieved a considerable reputation — beyond, perhaps even more than within, the borders of the Federation. In pasture research, bush control and veld management, in animal breeding and nutrition, in soil survey and classification, as well as in soil fertility, in legume rhizobia studies, in certain aspects of plant breeding and in irrigation research, we believe that our work is far ahead of any in Africa, and visitors from as far afield as Australia and America are attracted to particular aspects of it on particular stations. Yields of hybrid maize of more than 57 bags, of winter wheat of 23 bags and seed-cotton of up to 5,000 lb. per acre, which are fantastically high yields by world standards, have been achieved on large field plots on our research stations. Deciduous fruit research of a larger and more complex order than any known to us has already been laid down at Inyanga, fibre research has commenced and an extensive programme of legume breeding will start in the coming season. The Department is confident of its ability to meet any challenge and to continue to play its vital part in the development of a powerful agricultural economy.

AGRICULTURAL RESEARCH COUNCIL

The year under review has seen the physical start of several of the team projects discussed in previous years. Dr. Saunder and Dr. Grant, of the Chemistry Branch of this Department, are now at Grasslands in the new laboratories built by the Council for its Soil Productivity team, and about to commence on their programme of research. With the project, as with other Council projects, the research programme was formulated and finalized after a conference of all the relevant specialists from the three Territories.

The future of the Council will be profoundly affected by the dissolution of the Federation. Active steps are being taken to ensure its continuance as an autonomous body which will continue to serve the needs of fundamental research in fields common to the three Territories.

Whatever the future of the Council — and it is to be hoped that a strong Council will continue to bring in money for research from abroad — there is no question that, in Southern Rhodesia at all events, steady advance through applied research and the specialist control of agriculture will continue to depend very largely in the future, as it has done in the past, on the Department of Research and Specialist Services.

STAFF

In the period of political uncertainty and change covered by this review, when the world's press was more than usually alarmist and ill-informed, and even those on the spot found it difficult to discern the pattern of the future, it might have been expected that the staff position would deteriorate badly. In point of fact, it has maintained itself remarkably well, and although there are slightly more vacant posts than in the period covered last year, these are not accounted for by vacancies for professional officers. The position regarding vacancies is, in any event, never really clear, because offers of employment have been made in many cases. In the present instance the position is even more fluid and the figures are even less authoritative.

The long-awaited, improved conditions of service for professional officers came into effect during the year and although they only preceded by a few months the clear-cut indications of the end of Federation — and of the Federal Service — they did much to stabilize the position. Only very recently have similar improved salary scales for technical officers been announced. We have now a reasonably attractive career for men of ability, and many anomalies have, in recent months, been removed. But I would like to emphasize that the reason our staff position remains sound, in spite of political thunder and economic lightning, and in spite of the fact that their services are in demand in many other parts of the world, is that our trained and experienced research workers have been, and remain, dedicated to their work and to the progress of the country. In this connection there seems to be an increasing tendency here, as has developed in other parts of the world, for commerce and industry to make strenuous efforts to attract specialists from Government service into its own ranks.

The general staff position is outlined in the following table:

Establishment:

Superscale Posts	17
Senior Professional Officers	42
Professional Officers	65
Farm Superintendents	3
Farm Managers	5
Farm Assistants	3
Field Staff	1
Technical Maintenance Officer	1
Agricultural Technical Officers	59
Chief Meat Grader	1
Senior Meat Graders	4
Meat Graders	10
Supervisor Milk Recorders	1
Milk Recorders	10
Senior Plant, Fruit and Grain Inspectors	1
Plant, Fruit and Grain Inspectors	4
Contract Officers	4
*Other Posts	51
Higher Executive Officers	2
Administrative Clerical and Typist Posts	37
Agricultural Assistants	30
Laboratory Assistants	9
TOTAL	360

* *Other Posts consist of*: 1 Handyman (Henderson), 1 Stockman (Sabi), 8 Milk Recorders Assistants (Dairy), 7 Plant Inspectors' Assistants (Entomology), 1 Builder (Chibero), 1 Chief Cook (Chibero), 1 Hostel Supervisor (Chibero), 1 Senior Matron (Gwebi), 1 Matron (Gwebi), 1 Groundsman Handyman (Gwebi), 17 Laboratory Attendants (Various Branches), 11 Office Orderlies (Various Branches and Stations).

Resignations:

Superscale Posts	1
Professional Posts	10
Technical Posts	18
Clerical Posts	13
Branch III and IV Posts	6
TOTAL	48

(Includes 1 Retirement)

Transfers:

	From Department	*To Department*
Professional Officer	1	1
Technical Officers	5	3
Clerical	4	5
TOTAL	10	9

Appointments:

Professional Officers	11
Technical Officers	12
Contract Officers	2
Clerical	12
Assistants (Clerical and Laboratory)	4
Other Posts	4
TOTAL	45

Vacant Posts:

Senior Professional Officers	4
Professional Officers	12
Technical Officers	9
Clerical Officers	4
Assistants (Laboratory and Agricultural)	5
Other Posts	2
TOTAL	36

The Assistant Director of Research and Specialist Services, Mr. T. K. Sansom, retired during the year, after a long career in Scientific Agriculture in Rhodesia. Mr. J. C. Raath, formerly Chief Animal Husbandry Officer, was appointed to fill the vacancy and Dr. T. H. Vorster became Chief Animal Husbandry Officer.

FEDERAL STANDING COMMITTEE ON AGRICULTURAL PRODUCTION

This important Committee, which had fulfilled a very valuable role during the early years of Federation, and indeed right up until the middle of this year, dissolved recently when it became apparent that its effective and significant life was over. Before the rapid flow of political events had made this apparent, the Committee met on several occasions, for a tour of the Eastern Districts of Southern Rhodesia, at Grasslands Research Station and in Salisbury after attending a sheep day in the Charter area. The Committee did much towards acquainting responsible officers with the problems and potentialities of agriculture in the Territories, towards giving them a common approach and in enabling advice to be given to the Federal as well as to the Territorial Governments that was based on informed appreciation and reasoned discussion.

ITEMS OF SPECIAL INTEREST

In a year marked by changes and rapid developments, it is not easy to pick out those elements of most significance.

Unquestionably the most colourful event was the opening by Sir George Taylor, on 31st October, before a distinguished gathering, of the new Herbarium and Botanic Garden at Alexandra Park in Salisbury. Sir George, who had been attending Kirstenbosch Centenary Celebrations in Cape Town, broke his journey to Khartoum specifically for the purpose of performing the ceremony.

Another event of future historical significance was the initiation of a full-scale yellow maize-breeding programme at Henderson Research Station. This work is co-ordinated as part of the overall maize-breeding programme.

During the period under review Mr. Donovan completed his training and returned as Chief Horticulturist. We are indebted to the authorities in South Africa for their continuing and unstinted help in enabling Mr. Donovan to study everything possible in the Republic.

Mr. Pratt, the Coffee Specialist recruited in East Africa, assumed duty in December. He is stationed in Umtali and has already done much to spread the benefits of his accumulated wisdom and experience among coffee growers of the Eastern Districts.

There has this year been a sharp increase in soil samples submitted for analysis for fertilizer recommendation. At 5771 they show an 11 per cent. increase over the corresponding period of the previous year. There has been a steady increase in the numbers of samples from African areas.

Soil scientists from Southern Africa met in Salisbury for a SARCCUS sub-committee on Soil Science, and were joined by an American pedologist from the FAO team investigating the Kafue Valley. Under the guidance of their chairman, Mr. J. G. Thompson of the Chemistry Branch, they participated in an extended pedological tour of Southern Rhodesia.

There has been an improvement in the water situation at Henderson Research Station through the sinking of three boreholes and the utilization of water from the Savory Dam for extensions to the fish ponds.

During the year the Rhodesian Seed Maize Association took over responsibility for the multiplication of inbred and the production of single hybrid parent seed.

Apart from the usual group and specialist visits and meetings arranged at various stations, there were several large public field-days held this year. Henderson arranged three such days, one for general agriculturists, one for commerce, industry and education and one for Africans. Grasslands arranged one large field-day, as did Gatooma, and both the Eastern Highlands Research Station and Matopos held one major field-day devoted to beef.

Dr. G. R. Bates, Chief Botanist and Plant Pathologist, was, towards the end of the period, transferred to the Southern Rhodesia Government as a member of the Public Services Board. Dr. H. Wild is acting as Chief Botanist and Plant Pathologist.

PROFESSIONAL OFFICERS' CONFERENCE

After a lapse of some years, the Professional Officers' Conference, which was originally visualized as an annual event, was again held last year. The conference, over two days, was arranged by Dr. Weinmann and took place at Gwebi Agricultural College. The theme for discussion was "Climate and Agriculture in the Federation". A large number of delegates attended, including official representatives from South Africa and East Africa. The papers were varied and interesting and provided a thorough background for those not fully *au fait* with a subject of growing, and indeed possibly of critical, importance.

COMMITTEES AND BOARDS

The Committees and Boards attended by the Director were as follows:

- Federal Standing Committee on Agricultural Production (Chairman).
- Federal Research Advisory Committee (Chairman).
- Departmental Research Advisory Committee (Chairman).
- Fertilizer Advisory Committee (Chairman).
- Agricultural Research Council.
- Agricultural Research Council Consultative Committee on Agronomy and Animal Production (Chairman).
- Agricultural Research Council Editorial Committee, *Rhodesian Journal of Agricultural Research.*
- Tobacco Research Board.
- Seeds Research Advisory Committee (Chairman).
- Scientific Advisory Committee.
- Committee on Irrigation and Drainage.
- Rhodes Inyanga Orchards Liaison Committee (Chairman).
- Sabi Valley Development Committee.
- Committee of Inquiry into growing of Yellow Maize for Export (Chairman).

Senior Officers of the Department served on numerous inter-departmental and other Committees.

VISITS OUTSIDE THE FEDERATION

The following officers attended various meetings and conferences or participated in study tours:

Dr. B. S. Ellis discussed an investigation into the Ecology of Plants in relation to soils and geomorphology at the University of Cape Town.

Mr. J. A. Whellan attended meetings of the Inter-African Phytosanitary Commission in London in October 1962 and in August 1963 as Chairman of the Commission). He also attended as President of the Council the Annual Council Meeting of the International Red Locust Control Service at Luanda, Angola, and visited the Port of Beira in Portuguese East Africa to consult with officials on tobacco fumigation.

Mr. W. E. Kerr visited the Port of Beira with Mr. J. A. Whellan on consultations on seed fumigation.

Dr. G. R. Bates attended as a representative the meeting of CSA/CCTA, held at Dar-es-Salaam in the Republic of Tanganyika.

Dr. H. Wild visited Tete in Portuguese East Africa in connexion with his work on the *Flora Zambesiaca.* In August-September 1963 he also visited Kew Gardens in London and attended the triennial conference of the *Association pour l'Etude Taxonomique de la Flora d'Afrique Tropicale* in Geneva, Switzerland.

Mr. J. C. Raath made two visits to Pretoria as the Federal Government representative on the Pig Testing Centre Committee of South Africa.

Mr. P. A. Donovan visited Israel and Kenya to study Horticultural Production in those countries, and attended the open week of the Nelspruit Citrus and Sub-Tropical Horticultural Institute in the Republic of South Africa. He also visited Covent Garden in London to study the marketing of Rhodesian produce consigned by air.

Mr. A. G. H. Rattray and *Mr. J. M. Burton* visited various centres in the Republic of South Africa in a study of castor bean and sorghum production.

Mr. R. G. Jones was loaned to FAO in Rome for approximately three months to carry out studies on a text for a Guide to the Organization of Milk and Milk Products Marketing.

Dr. T. H. Vorster attended the annual general meeting of the South African Society of Animal Production in Cape Town. He also attended the World Conference on Animal Production in Rome and visited Yugoslavia, West Germany and the United Kingdom on a study of beef marketing methods.

Dr. W. L. Fielding, under the auspices of FAO, studied agricultural education in the Near East, Europe, United States and United Kingdom. He is now undertaking a similar study in Malaya, on behalf of FAO.

*Mr. R. G. Thomas a*ttended as a representative the International Soil Conference held in New Zealand.

Mr. R. B. Drummond paid a visit to the Herbarium in Pretoria in connexion with work on Rubiaceae.

Mr. R. P. Denny toured the Transvaal highveld and Natal during a study of pasture research in those regions.

Mr. P. V. M. Richards visited Natal on a special study of the problems in growing and processing Kenaf and other fibres.

Mr. D. J. W. Rose attended a symposium, on the use of radiation and radioisotopes in entomological research, held at Athens under the auspices of FAO. He also visited the United Kingdom to see various research stations.

Dr. J. O. Whiteside, with an FAO fellowship, is studying plant diseases in the United States of America.

Dr. F. E. M. Gillham completed his studies in cotton genetics at North Carolina State College, Raleigh, U.S.A.

Mr. A. H. McKinstry, with *Dr. F. E. M. Gillham,* visited the Cotton Conference held by the Ntambanana Farmers' Association in the Republic of South Africa. Mr. McKinstry also visited Swaziland at the invitation of the Swaziland Director of Agriculture.

Mr. A. Rothwell undertook a study into the taxonomic techniques used in plant mycology and bacteriology at Kew, and then went on an FAO fellowship to the United States.

Mr. C. N. Hayter attended an open week at Nelspruit Citrus and Sub-tropical Horticultural Institute in South Africa; and also visited Pretoria in connexion with horticultural research.

Mr. A. J. M. Carnegie toured various coffee estates in Kenya during a study course of coffee pests.

Mr. R. C. Elliott made a study tour to the United Kingdom in connection with his thesis for Ph.D. and attended the Animal Production Conference in Rome.

SECTIONAL REPORTS

There follow the annual reports of the branches and stations and agricultural colleges which, together, constitute the Department, and also a report on crop production.

CROP PRODUCTION

In most areas of the country rainfall was well above average, particularly in the early part of the season; but, unfortunately, almost all over the country it was below normal in March, the time when many crops, such as maize, are at a critical stage and need adequate moisture if they are to produce heavy yields of grain.

When figures become available early in 1964 it is expected that they will show a marked drop in the acreage planted to maize by European farmers in Southern Rhodesia. The final estimates of the acreage planted and of anticipated yields show a drop of nearly 60,000 acres with the yield remaining almost the same as that obtained in the 1961-62 season, 12.9 bags per acre. The quantities of hybrid seed sold indicate that the estimated fall in acreage is substantially correct. The total sales of seed dropped by 10,618 pockets to a total of 77,570, of which about 15,000 pockets were sent to Northern Rhodesia.

There is every reason to expect that the steady increase in maize yields which, subject to seasonal fluctuations, has taken place over the last 12 years, will continue. Although growers are still producing maize at an uneconomic level, 137 farmers averaged over 25 bags an acre in 1961-62, 194 farmers having achieved this figure in the more favourable 1960-61 season. An important factor contributing towards this upward yield trend is likely to be the more extensive use of the hybrid S.R.52 as larger quantities of seed become available .Approximately 13,000 pockets of seed of this hybrid have been produced for planting in the coming season and it is expected that, in a year's time, the amount will be almost quadrupled and should be more than adequate to meet demand.

This season the Rhodesia Seed Maize Association took over from the Ministry of Agriculture the responsibility for the multiplication of inbred and the production of single hybrid parent seed. For some years selected members of the Association assisted the Ministry in this work as the quantity and range of seed became too great for Panmure Hybrid Maize Farm to produce on its own. The change-over has taken place satisfactorily. Panmure Farm was offered for lease and reserves of seed were transferred to the Association. Whilst Northern Rhodesia have indicated that on the dissolution of the Federation they intend to set up their own Seed Maize Association and produce their own seed requirements, the loss of this market as far as Southern Rhodesia is concerned, which at present represents 20 per cent. of the Association's total sales, will be counteracted by the increased value of the seed produced as a greater proportion of single hybrid comes on the market.

A steady improvement in the standard of production of groundnuts is reported and yields have increased slowly. Although no breeding of new varieties has been attempted as yet, improved strains have been separated from the wide range of material present in the Federation and it is hoped that this work will have a marked beneficial effect on groundnut production in the future. In particular it is expected that strains isolated from Mani Pintar, the parent variety of Makulu Red, will prove well adapted to conditions in the higher-rainfall areas of Mashonaland. However, there is unlikely to be any very substantial increase in groundnut production on European farms until it is possible to mechanize the harvesting of the crop to a greater extent.

No significant increase in wheat production has taken place, although it is estimated that a larger acreage was planted this winter. Approximately 2 per cent. of the requirements of the country are grown at present and the country spends nearly £3,000,000 on importations. It is unlikely that this position will alter materially until cheaper irrigated water becomes available. Summer production is not likely to increase appreciably because of the hazards of stem rust, weed control problems and because the crop is not ecologically suited to the high temperatures normal in most parts of the country during the summer.

There has been renewed interest in the soya bean crop, largely because of the extensive markets available and the interest shown by prospective buyers from Japan and the United Kingdom. The crop is well adapted to Rhodesian conditions but so far, in spite of the wide publication of research findings, there has been no increase in farm yields which remain disappointingly low at 2.8 bags per acre. The crop is receiving increased attention from research workers and improved strains of rhizobia were available in inoculants produced by Grasslands Research Station and sold by the Farmers' Co-op., Salisbury. There do not appear to be any serious problems, or reasons why soya bean production should not expand, but in the initial stages of expansion harvesting will require some organization. The use of combines has been found by far the most efficient method of harvesting in other countries and, without mechanization of harvesting, the growing of soya beans is unlikely to expand.

Cotton has been grown in this country for almost 40 years but, until very recently, has made little progress. Now research has shown that regular and correct spraying at frequent intervals to control insect pests makes yields of 2,000 lb. of seed-cotton per acre possible, and in the right areas makes cotton a very profitable crop for Rhodesian farmers to grow. In addition, the crop fits well into maize rotations. Yield figures for the whole country show an upward trend and this is certain to become more pronounced as the new spraying techniques are adopted wherever cotton is grown.

No progress can be reported in castor bean production. A small party from the Ministry visited the Northern Transvaal in February and found that the most significant development with this crop was the breeding of dwarf high-yielding hybrids which can be planted at higher population levels and are suitable for harvesting with a combine. When seed of these hybrids becomes available, the growing of castor beans, particularly in the marginal rainfall areas, is likely to have more attraction for Rhodesian farmers. At the time of this visit, the Northern Transvaal was experiencing a very severe drought and the hardiness of castor beans and sorghums crops was most impressive. Whilst maize on some farms was suffering so severely that it was unlikely that any grain would be harvested, sorghums under the same conditions were going to give reasonable yields. As in the case of castor beans, the hybrid varieties of sorghum which are being developed by private enterprise are likely to have a marked effect on sorghum production. In some cases it has been possible to obtain seed for trial purposes in Rhodesia and the results have been most promising.

ANIMAL HUSBANDRY

Since this is to be the last Federal report on the livestock industries of the Rhodesias and Nyasaland, it seems appropriate to review briefly the changes which have taken place in animal production in the three Territories since the inception of Federation in 1953.

THE BEEF INDUSTRY

From the figures given in Table I it can be seen that the total number of cattle in the Federation increased from 4,274,000 head in 1953 to 5,368,000 head in 1962.

TABLE I

NUMBER OF CATTLE IN THE FEDERATION

Year	*Southern Rhodesia*	*Northern Rhodesia*	*Nyasaland*	*Total*
1953	3,029,000	972,000	273,000	4,274,000
1954	3,077,000	985,000	293,000	4,355,000
1955	3,147,000	996,000	307,000	4,450,000
1956	3,254,000	1,011,000	318,000	4,603,000
1957	3,415,000	1,047,000	328,000	4,790,000
1958	3,580,000	1,084,000	343,000	5,007,000
1959	3,646,000	1,134,000	357,000	5,137,000
1960	3,506,000	1,203,000	357,000	5,066,000
1961	3,687,000	1,283,000	374,000	5,344,000
1962	3,717,000	1,271,000	380,000	5,368,000

From a general livestock improvement point of view Table II shows that, as a result of increased immigration, the annual increment in cattle numbers in Southern Rhodesia rose at an increasing rate from 1953 to 1956-57, when it started to slow down as supplies caught up with the local demand for beef.

TABLE II

PERCENTAGE ANNUAL RATE OF INCREASE IN CATTLE NUMBERS (1953-1963) EXPRESSED AS % OF PREVIOUS YEAR'S FIGURES

Year	*Southern Rhodesia*	*Northern Rhodesia*	*Nyasaland*	*Federation*
1953-54	1.58	1.34	7.33	1.89
1954-55	2.27	1.12	4.77	2.18
1955-56	3.40	1.51	3.58	3.43
1956-57	4.95	3.66	3.14	4.06
1957-58	4.83	3.53	4.57	4.53
1958-59	1.67	4.61	4.08	2.48
1959-60	2.06	6.08	0.00	−1.07
1960-61	2.31	6.65	4.76	3.31
1961-62	3.62	−0.94	1.60	2.36

To stimulate production a start was made with the export of chilled and frozen beef to the United Kingdom in 1958-59. Unfortunately, a severe drought was experienced in 1959-60. This did not only adversely influence the supplies of high-quality beef available for export, but farmers actually suffered heavy stock losses and cattle numbers were reduced by 124,000 head.

From 1960 onwards, however, cattle numbers have been increasing and farmers have shown a renewed interest in beef production. In fact, as a result of reduced tobacco yields experienced in the eastern parts of the country and a general drop in maize prices, many farmers in the higher-rainfall areas have reverted to cattle production to obtain a more balanced and stable system of farming.

On the other hand, Table II shows that following a period of very rapid expansion in cattle production from 1956 onwards, the annual rate of cattle increases in Northern Rhodesia dropped very considerably during the 1961-62 season. The rapid increases recorded in cattle numbers in Northern Rhodesia from 1956 to 1960-61 may be attributed to a very substantial increase in the price of beef in 1956 and to the fact that the Cold Storage Commission of Southern Rhodesia extended its services to Northern Rhodesia in 1958-59.

From a production point of view it is important to point out that the large increases recorded in cattle numbers in Northern Rhodesia may partly be attributed to imports of slaughter stock. This should be considered in future production programmes if this country is to become self-supporting in beef.

The figures for Nyasaland show that, except for the past season when cattle increases showed a pronounced drop as compared with previous years, cattle numbers in this country have been increasing at approximately 3 to 4 per cent. per annum.

From Table III it can be seen that over the past ten years the number of cattle slaughtered in Southern Rhodesia, Northern Rhodesia and Nyasaland increased by 124,187, 19,029 and 12,707 respectively. These figures do not include subsistence slaughterings.

Table III

NUMBER OF CATTLE SLAUGHTERED

Year	*Southern Rhodesia*	*Northern Rhodesia*	*Nyasaland*	*Federation*
1953	227,923			
1954	256,271	54,936	23,146	334,353
1955	260,430	40,113	23,140	323,683
1956	237,069	39,613	26,660	303,012
1957	264,355	37,613	28,749	330,717
1958	282,030	40,366	29,149	351,545
1959	345,894	50,359	26,238	422,491
1960	357,395	58,961	29,445	445,801
1961	341,753	76,155	32,766	450,674
1962	352,110	73,965	35,853	461,928

The grades of cattle slaughtered in prescribed areas by the Cold Storage Commission and private butchers in Southern and Northern Rhodesia from 1960 to the end of September 1963 are given in tables IV, IVa, V and Va.

Table IV

COLD STORAGE COMMISSION SLAUGHTERINGS, SOUTHERN RHODESIA

	1959-60		*1960-61*		*1961-62*		*1962-63*	
Grade	*Number*	%	*Number*	%	*Number*	%	*Number*	%
R.B.	3,815	1.59	5,551	2.50	10,327	4.25	7,892	3.11
Imp.	10,028	4.18	17,243	7.79	16,372½	6.74	14,539	5.72
Std. A.	40,606	16.93	56,409	25.45	67,498½	28.60	61,296	24.40
G.A.Q.	68,174	28.41	78,682	35.49	79,372	32.67	81,095	31.93
F.A.Q.	51,556	21.49	35,625½	16.07	38,439	15.82	47,583	18.74
Comp.	49,617	20.68	23,593½	10.64	24,787½	10.20	33,842	13.33
Inf.	16,115	6.72	4,568	2.06	6,162½	2.54	7,707	3.03
TOTAL	239,911		221,672		242,959		253,957	

Table IVa

CATTLE SLAUGHTERED BY PRIVATE BUTCHERS IN SOUTHERN RHODESIA

Year	*1959-60*		*1960-61*		*1961-62*		*1962-63*	
Grade	*Number*	%	*Number*	%	*Number*	%	*Number*	%
R.B.	548	1.57	382	1.01	254	.82	232	.68
Imp.	1,796	5.16	1,473	3.90	861	2.76	798	2.33
Std. A.	4,295	12.72	4,136	10.96	4,079½	13.10	4,418	12.88
G.A.Q.	9,999	28.72	10,646	28.22	9,307	29.88	10,228	29.82
F.A.Q.	6,583	18.91	8,717	23.11	6,609	21.22	7,289	21.25
Comp.	9,218	26.47	9,949	26.38	8,170½	26.23	9,254	26.98
Inf.	2,382	6.84	2,417	6.41	1,868	6.00	2,078	6.06
Total	34,821		37,721		31,149		34,298	

Table V

COLD STORAGE COMMISSION SLAUGHTERINGS, NORTHERN RHODESIA

Year	*1959-60*		*1960-61*		*1961-62*		*1962-63*	
Grade	*Number*	%	*Number*	%	*Number*	%	*Number*	%
R.B.	125	1.58	292½	1.06	594	1.49	525½	.97
Imp.	300	3.80	741	2.68	2,698½	6.76	2,569½	4.75
Std. A.	1,561	19.74	3,850½	13.92	7,502	18.80	9,005	16.64
G.A.Q.	2,217	28.03	4,735½	17.12	8,197½	20.54	10,529	19.46
F.A.Q.	1,455	18.40	6,715½	24.28	8,205½	20.56	11,590	21.42
Comp.	1,326	16.77	7,766½	28.07	9,193½	23.04	14,099	26.05
Inf.	924	11.68	3,562½	12.89	3,511	8.80	5,795	10.71
Total	7,908		27,664		39,902		54,116	

Table Va

CATTLE SLAUGHTERED BY PRIVATE BUTCHERS IN NORTHERN RHODESIA

Year	*1959-60*		*1960-61*		*1961-62*		*1962-63*	
Grade	*Number*	%	*Number*	%	*Number*	%	*Number*	%
R.B.	113	1.16	215½	.85	48	0.27	52	.59
Imp.	349	3.59	1,213½	4.82	845½	4.89	237	2.68
Std. A.	2,019	20.80	5,484	21.79	3,833	22.15	1,173½	14.39
G.A.Q.	2,515	25.91	6,631	26.35	4,803½	27.75	1,780½	20.12
F.A.Q.	1,546	15.93	4,608	18.31	3,152	18.21	1,480	16.74
Comp.	2,051	21.13	5,127	20.37	3,118½	18.02	2,259	25.53
Inf.	1,115	11.48	1,890	7.51	1,508	8.71	1,765	19.95
Total	9,708		25,169		17,308½		8,847	

The above tables show that the cattle slaughtered by the Cold Storage Commission in Southern Rhodesia increased from 239,911 head in 1960 to 253,957 head for the year ending 30th September 1963.

The number of cattle slaughtered by the Cold Storage Commission in Northern Rhodesia increased from 7,908 head in 1960 to 54,116 in 1963.

On the other hand it can be seen that while butcher slaughterings in Southern Rhodesia increased by 3,149 cattle during the past season the number of stock slaughtered by butchers in Northern Rhodesia dropped from 17,308 in 1962 to 8,843 in 1963.

Furthermore, it can be seen that while the quality of beef slaughtered by butchers dropped very noticeably over the past four years there has been a marked improvement in the quality of slaughter stock delivered to the Cold Storage Commission.

In this connexion it is important to point out that producers tended to sell their high-grade beef from September to November when overseas prices are low. To obtain high-grade beef for export from January to March a new price schedule was introduced in March 1963.

Also a Commission was appointed to report and advise on the Production and Marketing of Beef in the Federation.

PIGS

The increases recorded in the number of European- and African-owned pigs in Southern Rhodesia, Northern Rhodesia and Nyasaland from 1953 to 1962 are given in Table VI.

Table VI

NUMBER OF PIGS IN THE FEDERATION

(in thousands)

	Southern Rhodesia		Northern Rhodesia		Nyasaland		Total	
Year	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*
1953	74	54	9	42	1	92	84	188
1954	64	47	9	34	2	81	75	162
1955	53	46	10	30	2	75	65	151
1956	50	47	13	40	2	75	65	162
1957	59	57	18	44	3	87	80	188
1958	58	56	17	46	3	80	78	182
1959	61	47	15	50	3	117	79	214
1960	62	42	12	53	2	70	76	165
1961	70	42	12	63	2	99	84	204
1962	70	63	11	61	2	103	83	227

From Table VI it can be seen that over the past ten years African pig production tended to increase more rapidly than European pig production. This can be attributed primarily to the fact that there are no discriminating markets for pig products in this country and European producers are finding it increasingly difficult to compete with African producers who, generally speaking, market a lower-quality product at lower costs. Since the standards of grading were changed during the course of the past ten years it is not possible to measure accurately whether production has improved qualitatively.

The numbers and grades of pigs slaughtered over the past year by Colcom Products Central Co-operatives Ltd. and private butchers in Southern and Northern Rhodesia are given in tables VII and VIII.

Table VII

PIGS SLAUGHTERED AND GRADED IN THE CONTROLLED AREAS OF THE FEDERATION

Southern Rhodesia

Colcom Products Central Co-operatives Ltd.

Grade	*Baconers*	*Porkers*	*Cutters*	*Underweight pigs*	*Overweight pigs*	*Sows*	*Boars*
A	41,438	15,546	2,243	—	—	5,024	362
B	7,218	5,823	2,023	307	—	1,747	125
C	1,820	—	—	—	—	—	—
L	1,393	653	56	96	—	—	—
X	5,151	5,710	4,669	910	—	—	—
Inf.	245	724	317	641	—	467	—
TOTAL	57,265	28,456	9,308	1,954	1,776	7,238	487

GRAND TOTAL 104,484

Private Butchers

	Baconers	*Porkers*	*Cutters*	*Underweight pigs*	*Overweight pigs*	*Sows*	*Boars*
A	446	2,509	606	—	1,040	—	—
B	69	1,430	458	477	753	—	—
C	21	—	—	—	—	—	—
L	12	183	118	54	—	—	—
X	2,577	5,914	4,294	1,401	—	—	—
Inf.	95	798	252	912	43	—	—
TOTAL	3,220	10,834	5,728	2,844	1,836		

GRAND TOTAL 24,462

Table VIII

Northern Rhodesia

Colcom Products Central Co-operative Limited

Grade	*Baconers*	*Porkers*	*Cutters*	*Underweight pigs*	*Overweight pigs*	*Sows*	*Boars*
A	4,647	1,555	151	—	—	455	—
B	656	594	141	84	—	138	23
C	120	—	—	—	—	—	—
L	94	3	—	7	—	—	—
X	112	538	325	206	—	—	—
Inf.	5	31	—	62	—	41	—
TOTAL	5,634	2,721	617	359	164	634	79

GRAND TOTAL 10,208

			Private Butchers				
Grade	*Baconers*	*Porkers*	*Cutters*	*Underweight pigs*	*Overweight pigs*	*Sows*	*Boars*
A	17	2,162	388	—	—	222	—
B	23	745	241	150	—	86	—
C	—	—	—	—	—	—	—
L	3	6	1	—	—	—	—
X	105	523	246	162	—	—	—
Inf.	4	26	—	48	—	17	—
TOTAL	152	3,462	882	360		325	
			GRAND TOTAL	5,181			

Pig Progeny Testing.

The latest annual report of the Salisbury Pig Progeny Testing Centre included results of 45 boar litter groups tested. Average results for the year were as follows:

	Landrace 1962-63	*Large White 1962-63*
Age in days at slaughter	176.7	179.1
Gain per day lb.	1.57	1.64
Feed conversion	3.43	3.46
Length of carcass mm.	848.3	820.7
Backfat—shoulder mm.	39.3	41.7
midback mm.	20.9	20.9
rump mm.	25.8	27.4
Eye muscle area (mm.)^2	3,102	3,221
Grading	3% L 96% A 1% X	9% L 78% A 12% B 1% X

SHEEP

The increases recorded in the number of European- and African-owned sheep in Southern Rhodesia, Northern Rhodesia and Nyasaland from 1953 to 1962 are given in Table IX.

TABLE IX

NUMBER OF SHEEP IN THE FEDERATION

(in thousands)

	Southern Rhodesia		*Northern Rhodesia*		*Nyasaland*		*Total*	
Year	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*
1953	106	168	6	13	2	51	114	232
1954	108	163	8	18	2	51	118	232
1955	106	145	9	18	3	76	118	239
1956	118	124	9	22	3	64	130	210
1957	130	118	10	29	3	55	143	202
1958	146	144	11	24	2	60	159	228
1959	161	154	12	22	3	72	176	248
1960	188	131	13	23	3	66	204	220
1961	201	161	15	23	3	79	219	263
1962	209	179	14	23	3	73	226	275

Table IX shows a very considerable increase in sheep production over the past few years, particularly under European conditions of farming in Southern Rhodesia.

To encourage sheep production a grading system was gazetted in 1960. It was agreed that the prices paid for the various grades should be negotiated between the Cold Storage Commission and producers. The grading systems were revised at the beginning of 1963 and the Cold Storage Commission agreed to pay fixed prices for sheep in prescribed areas.

The numbers and grades of sheep slaughtered by the Commission and private butchers in Southern and Northern Rhodesia for the year ending 30/9/1963 are given in Table X.

TABLE X

NUMBER AND GRADES OF SHEEP SLAUGHTERED IN THE CONTROLLED AREAS OF SOUTHERN RHODESIA

Commission Slaughterings					*Butcher Slaughterings*				
Lamb	*Number*	*Mutton*	*Number*	*Rams*	*Lamb*	*Number*	*Mutton*	*Number*	*Rams*
Super	368	Mutton 1	2,904		Super	119	1	5,897	
Lamb 1	1,145	Mutton 2	2,151		Lamb 1	851	2	3,431	
Lamb 2	2,804	Mutton 3A	3,991		Lamb 2	5,317	3A	5,255	
Lamb 4	648	Mutton 3B	1,530		Lamb 4	860	3B	2,014	
		Mutton 4	1,332				4	903	
TOTAL	4,968		11,908	405		7,147		17,500	1,642
Cold Storage Commission Total				17,311			Butchers' Total	26,589	

NORTHERN RHODESIA

Commission Slaughterings					*Butcher Slaughterings*
Lamb	*Number*	*Mutton*	*Number*	*Rams*	
Super	—	1	—		
1	1	2	9		
2	5	3A	15		NIL
4	10	3B	—		
—	—	4	4		
TOTAL	16		50		
Cold Storage Commission Total				66	

GENERAL

Close co-operation was maintained by the Branch with other departments on subjects of mutual interest. Numerous visits were made for specialist advisory purposes. Several staff changes took place during the year, but in general a fairly satisfactory staff position was maintained.

DAIRYING

DAIRYING SEASON

The exceptionally heavy rainfall which was a feature of the season was favourably received in most of the recognized drier regions but had an adverse effect on grazing and crops in the high-rainfall areas. Reduced yields of home-grown feeds affected milk production and, towards the close of the winter period, many producers had difficulty in maintaining the chemical composition of milk above the legal standards.

THE DAIRY INDUSTRY

DAIRY PRODUCTION

Preliminary figures indicate that overall milk production showed very little increase in Southern Rhodesia but steady expansion continued in Northern Rhodesia. Milk supplies to the Dairy Marketing Board followed a similar trend, the increase in Southern Rhodesia being 1.5 per cent. (236,000 gallons) as compared with 5.9 per cent. (174,000 gallons) in Northern Rhodesia.

Although climatic conditions may be partly responsible for the present position, the effect of decreasing producer prices cannot be overlooked. It is significant that the number of suppliers to the Dairy Marketing Board decreased in both territories and production was only maintained as a result of increased production at the remaining farms.

A disturbing feature in so far as the development of the industry is concerned, is the decrease in whole-milk sales, although it is encouraging to see small increases in African areas. Schemes for promoting sales to Africans are being investigated and this market would appear to have the greatest potential.

The demand for skim-milk in the form of 'Lacto' and skim-milk powder continued to increase. Sales of skim-milk powder by the Dairy Marketing Board increased by approximately 39 per cent. and substantial importations were required to meet commitments. Liquid skim-milk and 'Lacto' sales also showed a significant advance in Southern Rhodesia but remained at the previous year's level in Northern Rhodesia.

The increased sales of skim-milk products has had the effect of making Southern Rhodesia almost self sufficient in so far as butter is concerned. Ninety-two per cent. of apparent consumption was manufactured locally. In Northern Rhodesia there was a large shortfall which was met by importation as local manufacture only accounted for 18.7 per cent. of the estimated consumption.

Cheese production increased in both territories but was not sufficient to meet the demand. The shortfall was met by importation of cheddar cheese.

Production figures for the main commodities are given in tables I and II for Southern Rhodesia and Northern Rhodesia respectively and include production at factories operating independently of the Dairy Marketing Board. They are the Gazaland Co-operative Cheese Factory at Chipinga, EMCO Creamery, Umtali, which has now been taken over by the Dairy Marketing Board, and the Zambesi Co-operative Dairies at Livingstone.

Table I

DAIRY PRODUCTION 1920-1963: SOUTHERN RHODESIA

Year	Butter (1,000 lb.)	Cheese (1,000 lb.)	*Milk used for Dried Milk (1,000 gal.)	†Liquid Milk (1,000 gal.)	Total (1,000 gal.)
1920	600	79	—	258	2,000
1930	1,768	163	—	1,008	6,100
1940	1,686	383	—	2,095	6,910
1950	900	394	—	5,720	9,000
1955-56	1,083	2,168	—	8,050	13,202
1960-61	2,899	1,704	2,974	9,353	19,300
1961-62	3,074	1,845	3,859	9,690	20,700
‡1962-63	2,984	2,240	3,773	9,518	21,000

* Milk used for skim-milk powder production which started in 1957 and whole-milk powder production which started in 1960.

† Milk available for liquid milk, fresh cream and ice cream.

‡ Preliminary figures.

Table II

DAIRY PRODUCTION 1956-1963: NORTHERN RHODESIA

Year	Butter (1,000 lb.)	Cheese (1,000 lb.)	*Liquid Milk (1,000 gal.)	Total (1,000 gal.)
1956-57	40	497	1,750	2,400
1959-60	231	745	2,600	4,000
1960-61	316	496	3,040	4,400
1961-62	249	438	3,478	4,600
†1962-63	199	647	3,550	4,790

* Milk available for liquid milk, fresh cream and ice cream.

† Preliminary figures.

Tables III and IV show the number of producers and total milk intake to the Dairy Marketing Board in Southern Rhodesia and Northern Rhodesia respectively. As indicated earlier in the report, the trend is for increased production per farming unit and decrease in the number of suppliers.

Table III

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

Year	Number of Suppliers (August)	Total Milk Supplied (galls.)
1955-56	403	8,852,000
1959-60	531	13,815,000
1960-61	525	14,307,000
1961-62	527	15,236,000
1962-63	502	15,472,000

Table IV

DAIRY MARKETING BOARD: NORTHERN RHODESIA

Year	Number of Suppliers (August)	Total Milk Supplied (galls.)
1955-56	118	1,431,000
1959-60	137	3,076,000
1960-61	128	3,031,000*
1961-62	116	2,957,000*
1962-63	111	3,131,000

* These figures include butter-fat supplied under the 'separation on farm' scheme converted back to estimated gallons of milk.

Creameries, Butter Production and Consumption

For the greatest part of the season butter was only manufactured at Gwelo, Umtali and Lusaka. As indicated in last year's report, manufacture was discontinued at Salisbury and cream from this area was transported to Gwelo for manufacture. The latter arrangement was not found very satisfactory and new premises were erected at Salisbury which came into production in August. Small-scale butter manufacture continued at the Zambesi Co-operative Dairies and on farms in remote areas.

Butter production in Southern Rhodesia was slightly less than during the previous season but there was a marked decrease in Northern Rhodesia. The ending of the farm separation scheme in Northern Rhodesia was responsible for the decreased production in that territory.

In view of deficiency in local production, particularly in Northern Rhodesia, approximately 1¼ million lb. of butter had to be imported to meet the shortfall. Imports were received from Kenya, the Republic of South Africa and Australia in the following proportions:

Kenya	8.2%
Republic of South Africa	58.3%
Australia	33.5%

Exports of butter to Portuguese East Africa and Nyasaland continued and 174,000 lb. was also exported to Katanga.

The production and apparent consumption of creamery butter for Southern Rhodesia and Northern Rhodesia, showing the trends over the last few years, are given in tables V and VI respectively.

TABLE V

PRODUCTION AND APPARENT CONSUMPTION OF BUTTER: SOUTHERN RHODESIA

Year	*Production (1,000 lb.)*	*Apparent Consumption (1,000 lb.)*	*Shortfall met by Importation (1,000 lb.)*
1950-51	767	2,643	1,876
1956-57	1,398	3,997	2,599
1960-61	2,899	3,265	366
1961-62	3,074	3,200	126
1962-63	2,984	3,250	266

TABLE VI

PRODUCTION AND APPARENT CONSUMPTION OF BUTTER: NORTHERN RHODESIA

Year	*Production (1,000 lb.)*	*Apparent Consumption (1,000 lb.)*	*Shortfall met by Importation (1,000 lb.)*
1956-57	44	1,678	1,634
1960-61	316	1,281	965
1961-62	249	1,280	1,031
1962-63	199	1,065	866

Butter-fat prices to producers remained unchanged and minimum prices per lb. were as follows: —

	1st Grade	*2nd Grade*
	s. d.	*s. d.*
January to March	3 6	3 3
April and December	3 10	3 7
May to November	4 2	3 11

Maximum retail prices of butter in Northern Rhodesia and Southern Rhodesia remained unchanged and were as follows:

			s. d.	
Northern Rhodesia	—		4 1	per lb.
			2 1	per ½lb.
			s. d.	
Southern Rhodesia	—	1st Grade:	4 1	per lb.
			2 1	per ½lb.
		2nd Grade:	3 11	per lb.
			2 0	per ½lb.

There was no control on other grades of butter-fat or butter.

Sales of butter at prices well below the maximum prices quoted above continued and, in some cases, were even below the wholesale prices.

All grades of butter manufactured as a percentage of total production are given in tables VII and VIII for Southern Rhodesia and Northern Rhodesia respectively. Grading was carried out on a voluntary basis in Northern Rhodesia as there are no statutory requirements as in the case of Southern Rhodesia.

TABLE VII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE: SOUTHERN RHODESIA

Year	*First Grade (per cent.)*	*Second Grade (per cent.)*	*Third Grade (per cent.)*
1959-60	92.0	6.0	2.0
1960-61	93.0	5.0	2.0
1961-62	90.0	8.0	2.0
1962-63	87.0	11.0	2.0

TABLE VIII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE: NORTHERN RHODESIA

Year	*First Grade (per cent.)*	*Second Grade (per cent.)*	*Third Grade (per cent.)*
1959-60	84.0	—	16.0
1960-61	93.0	—	7.0
1961-62	100.0	—	—
1962-63	100.0	—	—

There was a marked deterioration in the quality of butter in Southern Rhodesia and this is attributed to the adverse effect of transporting cream from Salisbury to Gwelo. The position should improve now that manufacturing facilities have been provided at Salisbury.

The Dairy Marketing Board, Gwelo, continued to supply unsalted butter to a local manufacturer for making margarine containing 10 per cent. butter.

CHEESE

Six factories were registered for cheese manufacture, five in Southern Rhodesia and one in Northern Rhodesia. With the exception of the Gazaland Co-operative Cheese Factory at Chipinga, all factories were operated by the Dairy Marketing Board at Bulawayo, Gatooma, Salisbury and Umtali in Southern Rhodesia and Mazabuka in Northern Rhodesia.

Most of the cheddar cheese produced in Southern Rhodesia was manufactured at the Dairy Marketing Board's factory at Bulawayo, the balance being produced at Chipinga, and at Salisbury during the flush season. Very little was produced at Umtali as their main product of manufacture is the Gouda variety.

The production of Roquefort cheese continued at Gatooma and, in spite of staff changes, quality was maintained and sales showed a slight improvement.

Processed cheese manufacture by the Dairy Marketing Board at Bulawayo continued to increase but output was restricted by lack of facilities. New machinery has already been purchased and should be installed in the near future. Modern manufacturing plant and more attractive packaging should stimulate expansion in this field and reduce imports.

Cheese production in Northern Rhodesia was confined to the cheddar and Gouda varieties.

Although cheese manufacture increased in both territories, production was insufficient to meet the demand and cheddar cheese had to be imported to meet requirements.

Grading of cheddar cheese continued in Southern Rhodesia and was introduced in Northern Rhodesia on a voluntary basis at the request of the Dairy Marketing Board. Quality in Northern Rhodesia was disappointing at first but a marked improvement was evident towards the end of the season. Tables IX and X show the percentage of each grade of cheddar cheese manufactured for Southern Rhodesia and Northern Rhodesia respectively.

TABLE IX

CHEDDAR CHEESE GRADING AS A PERCENTAGE OF TOTAL CHEESE GRADED IN SOUTHERN RHODESIA

Year	*First Grade*	*Second Grade*	*Third Grade*
1957-58	97.3	2.4	0.3
1960-61	93.5	5.8	0.7
1961-62	97.0	2.8	0.2
1962-63	96.7	3.1	0.2

TABLE X

CHEDDAR CHEESE GRADING AS A PERCENTAGE OF TOTAL CHEESE GRADED IN NORTHERN RHODESIA

Year	*First Grade*	*Second Grade*	*Third Grade*
1962-63	78.9	18.4	2.7

Subsidy at the rate of 6d. per lb. was paid on cheddar cheese manufactured by the Gazaland Co-operative Cheese Factory and one farmhouse cheese maker until 30th June. From the 1st July subsidy was reduced to 5d. per lb.

Control over wholesale and maximum retail prices for cheddar and Gouda cheese was removed in October and during the year the wholesale price of cheddar and Gouda cheese increased by 4d. per lb. in Southern Rhodesia and 1d. per lb. in Northern Rhodesia. Wholesale cheese prices at the end of the season were 2s. 11d. per lb. in Southern Rhodesia and 3s. 1d. per lb. in Northern Rhodesia.

Milk Supplies and Milk Prices

As indicated earlier in the report, milk intake to the Dairy Marketing Board, Southern Rhodesia, showed very little increase but production continued to expand in Northern Rhodesia. In the case of the Zambesi Co-operative Dairies, Livingstone, intake increased by 10 per cent. but this was insufficient to meet the demand and a shortfall of approximately 33,000 gallons had to be purchased from the Dairy Marketing Board, Northern Rhodesia. This position arose chiefly as a result of additional commitments in Wankie due to the Wankie Colliery disposing of their dairy herd.

Tables XI, XII and XIII show the position regarding milk intake to the Dairy Marketing Board in Southern Rhodesia, Northern Rhodesia, and Zambesi Co-operative Dairies respectively in recent years, together with apparent consumption of whole-milk, and surpluses to whole-milk requirements.

Table XI

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

Year	*Total Milk Intake (1,000 gal.)*	*Apparent Consumption as Whole-milk (1,000 gal.)*	*Surplus over Whole-milk Requirements (1,000 gal.)*
1957-58	10.794	7,158	3,636
1960-61	14,307	7,162	7,145
1961-62	15,236	7,154	8.082
1962-63	15,472	7,036	8,436

Table XII

DAIRY MARKETING BOARD: NORTHERN RHODESIA

Year	*Total Milk Intake (1,000 gal.)*	*Apparent Consumption as Whole-milk (1,000 gal.)*	*Surplus over Whole-milk Requirements (1,000 gal.)*
1957-58	2,211	1,635	576
1960-61	2,766	1,688	1,078
1961-62	2,829	1,800	1,029
1962-63	3,131	1,846	1,285

Note.—The separation on farm scheme operated during 1960-61 and 1961-62. It is estimated that this reduced actual milk intake by 265,000 gallons in 1960-61 and 128,000 gallons in 1961-62.

Table XIII

ZAMBESI CO-OPERATIVE DAIRIES

Year	*Total Milk Intake (1,000 gal.)*	*Apparent Consumption as Whole-milk (1,000 gal.)*	*Surplus over Whole-milk Requirements (1,000 gal.)*
1958-59	163	137	26
1960-61	193	140	53
1961-62	199	162	37
1962-63	222	234	12 shortfall

Producer prices of milk supplied to the Dairy Marketing Board of Southern Rhodesia and Northern Rhodesia continued on the same basis as in previous years until 30th June. Thereafter all surplus milk was treated as a common pool and producers in both territories received the same net realization value for surplus pool milk. The effect of this change was to give Northern Rhodesia producers a slightly higher blend price due to higher net realization values for surplus milk.

Suppliers to the Zambesi Co-operative Dairy received fixed prices for all milk supplied at the rate of 3s. 3d. per gallon for the period October to February and 3s. 5d. per gallon from March to September. In addition, most producers qualified for a bonus of 4d. per gallon on all milk sold under the Dairy Production Assistance Scheme.

Tables XIV and XV show the actual prices paid for milk supplied to the Dairy Marketing Board of Southern Rhodesia and Northern Rhodesia respectively during the last two years.

TABLE XIV

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

Month	*Standard Price per gallon 1962-63*	*Actual Average Pay-out without Quality Bonus (per gallon)*	
		**1962-63*	*1961-62*
October	51	36.6	37.6
November	51	36.3	36.25
December	37	26.1	26.5
January	37	26.5	27.0
February	37	27.6	28.0
March	47	33.5	34.1
April	47	33.7	33.7
May	47	33.7	34.5
June	47	34.3	35.0
July	51	36.8	36.6
August	51	36.4	35.6
September	51	35.6	36.3

* Prices are subject to adjustment when the actual average realization value of surplus milk is determined by the Dairy Marketing Board.

TABLE XV

DAIRY MARKETING BOARD: NORTHERN RHODESIA

Month	*Standard Price per gallon 1962-63*	*Actual Average Pay-out without Quality Bonus (per gallon)*	
		**1962-63*	*1961-62*
October	51	41.5	45.0
November	51	42.38	39.75
December	37	29.3	26.6
January	37	30.1	27.2
February	37	32.0	29.1
March	47	38.5	37.42
April	47	38.7	37.65
May	47	38.1	38.66
June	47	37.8	38.5
July	51	40.5	41.6
August	51	40.2	40.75
September	51	40.4	42.25

* Prices are subject to adjustment when the actual average realization value of surplus milk is determined by the Dairy Marketing Board.

The retail prices for milk in the main towns of Southern Rhodesia remained unchanged at the controlled price of 8d. per pint. Although there is no legal control of prices in Northern Rhodesia prices charged by the Dairy Marketing Board remained at 8½d. per pint in the Midlands and 9½d. per pint on the Copperbelt. In the Livingstone area the Zambesi Co-operative Dairies continued to retail milk at 8½d. per pint.

FRESH CREAM

The demand for fresh cream was met by the main dairies and by a number of producer-retailers. No reliable estimate of total consumption can be made but Dairy Marketing Board sales increased by 15.7 per cent.

DRIED MILK

Skim-milk powder manufacture at the Gwelo factory was far from sufficient to meet commitments and large quantities were imported to meet the shortfall. Sales by the Dairy Marketing Board increased by 39 per cent. over the corresponding period of last year and exceeded 1,900 tons.

The Nestlés factory at Salisbury utilized nearly 1½ million gallons of milk for the production of dried whole-milk and proprietary baby food.

STERILIZED MILK

This product was produced by the Dairy Marketing Board at Bulawayo and Lusaka. Throughput was comparatively small and sales showed a slight increase.

ICE-CREAM AND OTHER FROZEN PRODUCTS

The two main producers of these commodities were the Dairy Marketing Board and Lyons. There were also a number of small producers including EMCO Creamery, Umtali, although the latter ceased production early this year.

Sales of ice-cream and frozen products by the Dairy Marketing Board showed a substantial increase both in Southern and Northern Rhodesia.

DAIRY BONUS SCHEME

This scheme has been in operation since 1954 and operates in Southern Rhodesia only. It is estimated that the bonus payable this season will slightly exceed the payment of £9,526 for the 1961/62 season, owing to increased cheese milk production by participants in the Chipinga area.

MILK RECORDING

The new system referred to in last year's report is operating smoothly and the mechanical analysis of lactation records on punched Hollerith cards should commence in the near future.

There were a number of withdrawals from the scheme during the year, the majority on account of members selling their dairy herds. The number of cows recorded did not show a proportionate decrease as there is a tendency for producers to increase the size of their herds and also the majority of withdrawals consisted of small herds.

The following tables XVI and XVII give the production figures for winners of competitions and average production per cow recorded respectively in recent years.

TABLE XVI

PRODUCTION OF WINNING HERDS IN MILKING COMPETITIONS

(Average of the best fifteen cows in the herd)

Year	*Milk Section* *lb.*	*Butterfat Section* *lb.*
1956-57	14,908	511.9
1959-60	17,497	601.2
1960-61	16,272	593.3
1961-62	17,077	606.5

TABLE XVII

AVERAGE PRODUCTION PER COW: PEDIGREE AND GRADE HERDS

Year	*Number of Lactations*	*Average Milk Production per Cow (lb.)*	*Average Butter-fat Production per Cow (lb.)*	*Average Butter-fat Percentage*	*Days*
1956-57	9,050	6,683	257.7	3.86	286
1959-60	12,330	6,643	267.0	4.02	276
1960-61	11,825	6,746	270.6	4.01	275
1961-62	11,710	6,768	264.1	3.9	280

GENERAL

As mentioned in last year's report, the butter-making activities of EMCO Creamery, Umtali, were taken over by the Dairy Marketing Board, and early this season manufacture commenced at the new Dairy Marketing Board Creamery. Manufacture of butter was also resumed at Salisbury.

In view of the rapid expansion in ice-cream and frozen confection sales, attributed largely to the installation of the Vitaline machine, additional cold storage facilities were provided at Salisbury. All small packs of these commodities are now manufactured at Salisbury Dairy which supplies the Southern Rhodesia and Northern Rhodesia markets.

Amendments to the Dairy Produce Marketing and Levy (Milk Levy) Regulations, 1962, were introduced on the 1st February, 1963, the effect of which was to introduce payment of levy by registered producer-retailers in Northern Rhodesia on all milk sold by retail in prescribed areas. The rate of levy was fixed at 4d. per gallon until the 31st January 1964 and thereafter at 8d. per gallon, which is the rate levied in Southern Rhodesia.

DAIRY BRANCH

The work of the Branch includes statutory inspections and registration of factories and farm dairies, grading of dairy produce, sampling and testing of milk, both for the purposes of the scheme for payment on quality basis and advisory purposes, advisory work on milk production and manufacture, lecturing at Gwebi and Chibero Agricultural Colleges, judging dairy produce at agricultural shows, and operating the Milk Recording Scheme.

Apart from the transfer of one Milk Recorder from Bulawayo to Salisbury, the disposition of staff has remained unchanged. There are now two Dairy Officers and one Milk Recorder at Lusaka, one Milk Recorder at Bulawayo, one Dairy Officer and one Milk Recorder at Gwelo, one Milk Recorder at Umtali and the remainder of the staff at Salisbury.

All meetings of the Dairy Marketing Board were attended by the Chief Dairy Officer, or his deputy, and numerous other meetings of farmers were attended by officers of the Branch.

The Chief Dairy Officer was nominated by the Food and Agriculture Organization of the United Nations to carry out a survey of the dairy industry in a number of African countries. He returned at the end of October after an absence of three months.

Every effort has been made to meet the demands made upon the Branch and to maintain efficiency, and in this respect the willing and loyal co-operation of all members of staff during this difficult year is greatly appreciated.

PUBLICATIONS

G. M. Phillips.—'Circulation Cleaning of Dairy Equipment'. *Rhodesian Agricultural Journal*, 59, pp.303-305, 1962.

I. Stansby.—'Milking Efficiency in Rhodesia — and How it can be Improved'. *Rhodesian Agricultural Journal*, 60, pp.17-19, 1963.

R. G. Jones and G. M. Phillips.—'Bacteriological Quality of Rhodesian Farm Milk Supplies'. *Rhodesian Agricultural Journal*, 60, pp.58-60, 1963.

A. B. Edwards.—'The Methylene Blue Test — a Blessing or a Curse'. *Rhodesian Agricultural Journal*, 60, pp.106-107, 1963.

T. S. Leadley.—'Official Herd Averages'. *Rhodesian Agricultural Journal*, 60, pp. 128-130, 1963.

POULTRY

INTRODUCTION

Conditions within the industry remained settled during the year. Production of poultry products continued to supply all requirements, with exports, particularly of day-old chicks, increasing markedly.

The returns to producers declined slightly, but with greater stability, in the broiler market, and with egg prices being maintained at previous levels.

The Poultry Advisory Committee to the Ministry met on two occasions during the year. The chief matters of importance under consideration were:

(1) *Introduction of compulsory grading of eggs in specified areas:* A scheme was drawn up by this Branch and submitted to the Rhodesia National Farmers' Union Poultry Committee and the Federal and Southern Rhodesia Governments, but in view of the imminent dissolution of the Federation the scheme has been left to the Southern Rhodesia Government for further consideration. Northern Rhodesia were not in favour of introducing grading regulations.

(2) *Introduction of registration of poultry producers:* This was not acceptable to the Federal Government.

(3) *Introduction of regulations governing farm and other poultry processing plants:* Regulations were drawn up by this Branch, in collaboration with the Ministry of Health, to be exercised under the Public Health Act. These regulations will be in force shortly in Southern Rhodesia, where producers have been strongly in support of such regulations.

Co-operative marketing of poultry products has received considerable attention particularly by the Rhodesia National Farmers' Union Poultry Committee. In Bulawayo the Poultry Association is sponsoring a co-operative selling organization and results will be watched with keen interest by all connected with the industry.

EGG PRODUCTION

Egg production has remained steady in both Rhodesias with prices fractionally lower than last year with a producer price of 3s. 3d. per dozen in Southern Rhodesia and 3s. 9d. in Northern Rhodesia.

The seasonal fluctuation in production and prices occurred, but with less variation.

Proposals for a co-operative egg marketing organization in the Bulawayo area are receiving support but the organization has not yet become operative.

Supplies of pulp used by bakers have been adequate.

There has been an increase in export of eggs to the Congo.

TABLE POULTRY

The production of table poultry, mainly broilers, has increased further and the market appears to have stabilized after the over-production reported last year, though prices are below previous levels. A producer price of 3s. per lb. for broilers and 2s. for roasters is general.

Exports, mainly to the Congo, increased three-fold and afford a useful outlet for broiler producers.

TURKEYS

Turkey production has increased and with the advent of a few large specialist producers the quality of birds offered for sale has shown marked improvement. Cold storage facilities have enabled producers to raise turkeys at all seasons and to hold them for the Christmas market. The crop this year appears to be heavy and some export may be possible.

DUCKS

Insufficient ducklings are produced by breeders for the requirements of the growers and some importation of ducklings has been required. Production of table ducks has remained steady.

POULTRY MANAGEMENT AND DEVELOPMENT

The housing and management on specialist poultry farms is improving continuously, as efficient production is essential under present-day marketing conditions. Capital expenditure on modern housing, batteries and equipment is increasing annually for the production of both eggs and broilers.

Attention to labour-saving methods, water reticulation and artificial lighting for layers is becoming more general. The first automatic feeding units were installed in Southern Rhodesia this year.

On breeding farms there has been even greater development on the larger units as the export of day-old chicks from the improved breeding stock imported during the last two years is now finding increasingly large markets in other African territories. The potential in the export of day-old chicks of this quality is very large and breeders in Southern Rhodesia are in an excellent position to capture most of this business. Southern Rhodesia now is reputed to have the largest hatchery in Africa south of the Sahara which sold over 1,000,000 chicks and is to be increased by a further 100,000 egg capacity next year.

Available feeds for poultry are of the very best, and apart from imported fish from South Africa are, or can be, produced in the Federation.

Conditions are, therefore, promising for increased production of poultry products and the establishment of export markets.

Production of poultry products by African farmers, particularly in Southern Rhodesia, is increasing and many are now entering the cash economy as opposed to subsistence farming. African consumption of poultry products is also rising in urban areas.

IMPORTS AND EXPORTS

The imports of poultry products were negligible during the year, mainly consisting of some breeding stock and table ducklings.

Exports were encouraging, all products showing threefold increases over 1962. The favourable balance was £73,662.

The following tables give the details of imports and exports of poultry products for the Federation from August 1962 to July 1963 inclusive:

TABLE I

IMPORTS

Article and Country of Origin	*Quantity*	*Value*
Poultry live (No.):		£
Republic of South Africa	4,891	338
United Kingdom	1,999	429
Sweden	1,330	330
Ireland	181	49
TOTAL	8,401	1,146
Poultry, dressed (lb.):		
Tanganyika	551	99
Republic of South Africa	408	93
United Kingdom	113	23
France	24	30
TOTAL	1,096	245
Eggs in shell (dozen):		
Republic of South Africa	1,635	245
Tanganyika	163	32
United States of America	83	15
United Kingdom	19	22
TOTAL	1,900	314
Eggs, liquid, frozen or dried (lb.):		
United States of America	2,010	709
United Kingdom	579	358
Republic of South Africa	256	153
TOTAL	2,845	1,220

TABLE II

EXPORTS

Article and country of destination	*Domestic Produce*	
	Quantity	*Value*
Poultry, live—mainly day-old-chicks (No.):		£
Bechuanaland	1	3
Congo Republic	199,406	22,668
Kenya	78,961	9,084
Moçambique	127,092	9,718
Nigeria	27,250	2,548
Tanganyika	9,075	1,028
Swaziland	500	98
Republic of South Africa	50	50
TOTAL	442,335	45,197
Poultry, dressed (lb.):		
Congo	136,227	24,844
Bechuanaland	2,828	443
Mooçambique	1,157	184
United Kingdom	20	2
TOTAL	140,232	25.473
Eggs in shell (dozen):		
Congo	25,600	5,245
Moçambique	2,116	435
Bechuanaland	1,209	231
TOTAL	28,925	5,911
Eggs, liquid, frozen or dried (lb.):	Nil	Nil

During the year the Central Statistical Office of the Federal Government endeavoured to obtain quarterly poultry statistics but the response from farmers was so poor the attempt was abandoned. Owing to this the usual annual figures for the numbers of birds were not included in the farm census and are, therefore, not available. However, it would appear from the production figures which were obtained that there has been a slight drop in the numbers of laying stock, but increases in the numbers of table birds and day-old chicks sold. The following are the figures for the poultry products sold in 1962:

TABLE III

	Southern Rhodesia	*Northern Rhodesia*
Hen eggs sold: No. (doz.)	2,698,827	916,900
Value (£)	441,113	164,450
Table birds sold: (wt. lb.)	2,218,329	374,220
Value (£)	348,126	68,860
Day-old-chicks sold: No.	1,274,672	71,335
Value (£)	112,121	7,419

GWEBI COLLEGE

The Forty-third Annual Official Egg-laying Test concluded on 30th January 1963: a full report was published in the March/April issue of the *Rhodesia Agricultural Journal*. The results, though satisfactory, were lower than the previous test. The mortality showed slight improvement.

The Forty-fourth Test commenced on March 1st and to date production shows great improvement, particularly in the light breeds. This will be the last standard breed type of test to be held, as provision has been made to hold a Random Sample Test in 1964, the day-old chicks for which were taken during September this year. There will be a sample of 40 pullets from 10 entries competing on a commercial basis and the test will be run at both Gwebi and Matopos Stations.

LECTURES AND STUDENT INSTRUCTION

The lecture programme was 41 lectures and each student visited the poultry section for six days.

RESEARCH

The research programme was changed radically from breeding research to nutrition and physiology.

A start has been made, in existing buildings, on research aimed at showing how best to supplement this country's climate and natural day-length with artificial daylight to produce an optimum environment for maturity and egg-production strains now available in this country.

Early indications are that not only is artificial lighting beneficial in producing an even level of production throughout the year, but that egg production from existing strains has been increased by as much as 15 per cent. without having to resort to the 'environmentally controlled' housing which is necessary overseas.

Because it seems possible that larger and larger numbers of poultry will be kept on maize-producing farms, the Branch's nutrition work has been aimed primarily at higher rates of maize inclusion in laying rations.

The Branch has been successful in producing a ration giving 84 per cent. average production over seven months with 70 per cent. maize in the ration.

The above two factors will, in the long run, lead to the production of cheaper eggs.

Munga rations for broilers were tested during the year with very satisfactory results.

A soya bean ration was compared to normal commercial rations, and while satisfactory, the low yield of six to eight bags to the acre of soya beans made the ration uneconomical.

DEVELOPMENT

A new house for continuation of lighting experimental work is nearing completion. This will speed up this phase of the work considerably.

A broiler house to produce 400 broilers every 13 weeks is under construction, and will provide student instruction in this phase of poultry production.

The house is designed for two replicates of four rations, so it can be used for finally testing rations after pilot experiments with small samples in batteries.

Eggs and table poultry were supplied to the College hostel and staff, and the surplus was absorbed by Salisbury hospitals.

MATOPOS RESEARCH STATION

This station was without a resident poultry officer throughout the year, which handicapped development there and advisory work in Matabeleland. It has been found impossible to obtain professional poultry officers under present conditions.

The new Broiler Research Building was proceeded with and will be complete by the end of the year.

The old stock has been sold off and will be replaced from Gwebi shortly for nutritional studies. Broiler stock will also be acquired to commence broiler research work on housing and nutritional requirements in 1964. However, the appointment of a suitable officer as soon as possible is essential.

The Fourth Commercial Egg-laying Test ended on 30th January, results of which were published. The Fifth Test commenced on 1st March and is progressing satisfactorily.

SPECIALIST ADVISORY WORK

Farm visits were reduced owing to the absence of a Poultry Officer in Matabeleland; however, over 500 farm visits were made, of which 350 were in Northern Rhodesia.

All meetings of the Poultry Advisory Committee and the Rhodesia National Farmers' Union Poultry Committee were attended as well as meetings of the various poultry associations and clubs.

All poultry shows were judged by poultry officers.

The Chief Poultry Officer made three inspection and advisory visits to Northern Rhodesia.

The Poultry Officer in Northern Rhodesia assisted in the CCTA Poultry Course for African personnel held at Entebbe in May.

VETERINARY

The testing of all breeding stock for BWD and fowl typhoid was carried out by the respective Veterinary Departments. The incidence of these diseases in European flocks is very low.

Newcastle disease in Northern Rhodesia in European flocks was not encountered and the inoculation programme is very successful.

With the appointment of the Avian Pathologist in Southern Rhodesia a survey of disease in breeder flocks has been commenced.

The incidence of respiratory diseases is still troublesome and may be more widespread than previously thought.

STAFF

The lecturer in poultry at Gwebi College resigned to take up a commercial post at the end of the year. There are thus two vacancies which must be filled as soon as possible. The Chief Poultry Officer is also due for retirement next year, which makes the staff position in this Branch very serious indeed.

PASTURE RESEARCH AND ECOLOGY

THE IMPORTANCE OF GRASS IN INCREASING AGRICULTURAL PRODUCTION

Grass is not sold and, in the balance sheets of farming enterprises, it is seldom credited with any share in the farming profit. Yet grass contributes very importantly to most of the income derived from farming. It is basic to the success of the enterprise and without it farming would be much more difficult and much less rewarding.

Without grass there could be no future for the livestock industry, no hope of expanding it.

In arable agriculture, the proper use of grass leys can be of immense benefit to the cash crops grown in the rotation. Grass leys of species resistant to root-knot nematodes are essential to the tobacco grower and without them, the spectacular increase in the quantity and quality of the tobacco crop in recent years would not have been possible. At Henderson it is being shown that the economy of maize growing is greatly increased when grass or grass/legume leys are used in place of the traditional green manure crops.

Grass leys allow the development of productive livestock enterprises in farming systems devoted primarily to the production of cash crops and will, when their management, utilization and productivity are fully appreciated, provide the source of a very great increase in the products of livestock husbandry, of beef and milk, mutton and wool.

This capacity for production is at present unrealized by the majority of farmers, but it undoubtedly exists and could be developed much more quickly than is being done.

The Minister of Agriculture in Southern Rhodesia, Lord Graham, recently pointed out that the development of agriculture offered the quickest and surest way of 'getting the wheels of prosperity once more revolving'. He indicated that there was tremendous scope for further increases in economical production. In this increase, grass and grass in the wider sense, the produce of grass/legume pastures, has a very significant, perhaps a major role to play. The 'know-how' exists on the research stations but it requires both imagination and skill to bring the pieces together in the most effective way and as yet this knowledge is not having its proper effect on the productivity of agriculture.

What is needed is a link between the research worker, who is devoted to research for research's sake, and the farmer who is dependent on the results of research for improving the productivity of his farming.

The first step in this link, as has been stressed repeatedly in previous annual reports, could best be provided by the establishment of a small number of specialist advisory officers, thoroughly versed in the skills and practice of veld and pasture management. This is accepted in the case of animal husbandry and for certain special crops, but has never been provided for the most basic essentials of stock farming, the veld in the drier and less developed parts or for established pastures in the areas capable of being farmed intensively. This is tragic when it is realized that the management of veld and pastures, if their full benefit and productivity is to be attained, requires considerably more knowledge, skill and initiative than that of most crops.

THE RESEARCH STATIONS

GRASSLANDS

At Grasslands, work on the plants in the Introduction Nursery continues and the collection is continually being increased by the addition of interesting grasses and legumes from the Federation and from other countries.

In a grass screening trial where some 120 grasses are under test with differential cutting and grazing management, the *Paspalum* species continue to impress. They appear to be productive and palatable, will withstand intensive grazing and cutting, set viable seed and do not harbour root-knot eelworm. Muguga Star Grass, though a host to root-knot eelworm, has also shown up well. It is similar in appearance and characteristics to the No. 2 Star Grass in current use except that it is capable of rapid growth in the early season. Strains of *Vossia cuspidata* show promise for winter grazing.

Vossia is a genus which has not previously been cultivated. The nursery contains a number of types which show a great range of adaptability to soils and soil moisture conditions. Though they are capable of living in fairly deep water they thrive on dry land at Grasslands. *Echinochloa pyramidalis* exhibits a similar range of adaptability. It is an extremely variable grass and the nursery contains a number of promising types.

In a comparison of six rhizomatous grasses, yields were obtained for the second harvest year. The trial includes three selections of local *Cynodon* spp., Coastal Bermuda Grass, Kafuba Nile Grass and Paraguay *Paspalum notatum*. The highest yields of dry matter and crude protein were obtained with Paraguay Paspalum. Where 150 lb. of nitrogen was applied per acre, the seasonal yield of this grass was 9,500 lb. of dry matter containing 1,060 lb. of crude protein. The recovery of applied nitrogen was 80 per cent.

Sabi Panicum, planted in rows 3 ft. apart, again gave higher yields than when grown in broadcast stands, the seasonal dry matter yields being 20 per cent. higher for grass planted in rows and not cultivated, and 25 per cent. higher for row-planted cultivated grass. But in a soil productivity experiment in which a test crop of maize followed a four-year ley of Sabi Panicum, yields of the test crop were 15 per cent. lower where the grass had been grown in rows 3 ft. apart than where it had been grown in a broadcast stand. Surprisingly, the maize yield decreased in proportion to the amounts of nitrogen which had been applied to the ley, being 27.5 bags per acre where 20 lb. nitrogen per acre per season had been applied to the ley and 23.4 bags per acre where 140 lb. N per acre per season had been applied. No fertilizer nitrogen was applied to the maize test crop.

Increases in yield in the order of 15 and 20 per cent. have been recorded with Sabi Panicum where each of 20,000 lb. of dolomitic limestone and 100 lb. of potassium chloride have been applied per acre.

The effect of pruning the roots of Sabi Panicum is being studied on normal soil and on soil to which 60 tons per acre of dry compost has been added. Adding compost resulted in very large increases in yield. Pruning of the roots at the start of the rains in the second harvest year led, on both soil conditions, to sharp decreases in yield in the mid-season cut, as compared with grass where the roots were not pruned. In the second cut in late May the effects of pruning were much smaller, especially in the composted plots.

In small plot studies on the effects of management during the growing season on the composition and yield of Sabi Panicum foggage, it was again found that with a long rest before the foggage grazing season the foggage contains an excessively high proportion of stem. An extreme value of 70 per cent. stem was recorded where vigorous Sabi Panicum was left to grow for the full season.

Further study was made of the effect of stocking rates on Sabi Panicum foggage and of supplementary feeding with green oats forage and maize meal on the live weights of yearling Africander steers. This experiment is nearing completion. The live-weight changes so far, that is for the period early June to mid-September, are shown below.

EFFECTS OF STOCKING RATE AND OF SUPPLEMENTARY FEEDS ON LIVE-WEIGHT CHANGES OF YEARLING STEERS GRAZING SABI PANICUM FOGGAGE

Stocking rate	*Proportion of green oats dry matter and maize meal dry matter fed in a supplement of 4.5 lb. dry matter per steer per day*					*Mean*
	4 : 0	3 : 1	1 + 1	1 + 3	*No Supplement*	
	lb. live-weight gain or loss per steer					
1 steer to ¾ acre	+59	+42	+57	+31	−7	+36
1 steer to 1½ acres	+61	+65	+65	+72	−8	+51
Mean	+60	+54	+61	+51	−8	

In contrast to the results of a similar experiment conducted during the 1962 dry season there appears to be no benefit in feeding a combination of maize meal and green oats as compared with green oats alone. In general, responses were only slightly less at the heavier, as compared with the lighter, stocking rate.

In an exploratory trial Sabi Panicum silage and foggage hay is being fed in varying proportions to yearling Africander steers. The results indicate that an acre of Sabi Panicum pasture fertilized at the rate of 80 lb. nitrogen per acre per season will provide sufficient silage and foggage hay to maintain three to four yearling steers for the four-month period June to September inclusive.

Dryland Pasture Legumes

In this the third season of trial, some 50 of the original 100 plantings of pasture legumes remained under observation in the dryland nursery. The following species are of major interest:

Lotononis bainesii
Desmodium discolor
Styolanthes mucronata
Trifolium semipilosum
Listia heterophylla
Desmodium intortum
Stylosanthes guyanensis
Dolichos formosus
Medicago sativa

Because of damage by severe frosts to *Desmodium intortum, Dolichos formosus* and *Stylosanthes guyanensis* very little seed was obtained in seed production plots of these species.

In a study of the effects of various fertilizers on the growth of *Teramnus uncinatus* and *Aeschynomene americana* marked responses were obtained with the use of dolomitic limestone and compost placed in bands under drill-rows. With *Aeschynomene*, but not *Teramnus*, small responses were recorded where gypsum and ammonium nitrate were applied.

HENDERSON

At Henderson the pasture programme is designed to cover two separate aspects of agriculture in the higher-rainfall region of the country. First, pasture farming in the fertile soils is being investigated against a background of maize production and secondly, problems of small-scale intensive farming on granite sands are being explored.

One of the most interesting aspects is the success that has been obtained in the field scale use of the tropical pasture legumes *Desmodium intortum* and *Desmodium discolor*.

Both species were again successfully established in cover crops of maize after these had received their last cultivation.

Desmodium intortum, which was grazed by dairy cows for two hours daily to supplement Giant Rhodes Grass pastures during the growing season, provided 238 supplementary grazing days per acre. In addition, it was necessary to impose 17.5 full-time grazing days per acre during January to control the legume's growth. A first-year pasture which was grazed until mid-January and then closed for a silage cut, harvested in May, provided 8.19 tons of edible silage per acre. The herbage was reaped with a flail-type forage harvester and was readily consumed by all classes of cattle.

A yield of 21.4 bags per acre was obtained from a maize crop grown without nitrogen fertilizer on land which had been down to *Desmodium intortum* for the two previous seasons. When 20 lb., 40 lb., and 80 lb. nitrogen were applied to the crop the yield was increased to 23.6, 28.0 and 32.9 bags per acre respectively.

Similar results have been recorded from trials in which *Desmodium discolor* was used to provide protein-rich autumn grazing and silage. The vigour of the plant was considerably reduced if more than one silage cut was taken in addition to the autumn grazing.

Results indicate that this legume can be established in the veld where it will compete successfully with the native grasses.

Where cattle had access to legume grazing in addition to Rhodes Grass grazing faecal nitrogen data indicated that an intake of protein, similar to that obtainable from grass in early summer, was maintained throughout the grazing period.

That *Desmodium intortum* is resistant to the common root-knot nematode, *Meloidogyne javanica*, is of particular interest.

Experiments designed to provide information on the optimum method of sowing grasses into established stands of pure legume have shown that where the legume is not checked, the vigorous growth prevents development of the grass seedlings. This competition can be reduced by cutting or grazing the legume during the growing season and it has been found that this defoliation can be used to provide the silage and autumn grazing necessary for practical feed sequences.

Where grasses are sown into established legume stands the contribution of nitrogen towards the growth of grass by the legume appear to be in the order of 80 lb. per acre. These mixed pastures, fertilized with 200 lb super-phosphate, provide 136 grazing days per acre during the growing season.

MATOPOS

At Matopos the main emphasis during the year has been on the botanical analysis of long-standing experiments and the statistical analysis of experimental data for a report which is designed to cover the veld management and ecological work in Matabeleland since its beginning in 1945.

Results in basal cover measurements show that effects of treatments are in close agreement with the visual observations that have been made in the past. In the isolation transect on thornveld, basal cover was reduced from 4 per cent. to ½ per cent. by heavy grazing, as measured by charting, while the cover after 15 years of protection was 6 per cent. The cover as measured by point-quadrat methods was more variable and tended to be higher than the corresponding charting figures, though the same trends in response to grazing were apparent. The results of charting the isolation transect on sandveld are incomplete but the point-quadrat analysis indicates that cover there was much less affected by grazing than on the thornveld.

The three long-term veld fertilizer experiments were harvested in January and February. This year the harvesting was done by hand, species by species, which has resulted in a good measure of the species contribution and composition after nine years of fertilizer application. Total dry matter yields and crude protein contents (all species) were as follows:

		lb. nitrogenous fertilizer per acre				
		0	*300*	*600*	*900*	*1,200*
Black Soil	lb. D.M.	2,260	3,470	3,760	4,050	3,580
	C.P.%	6.3	7.4	11.3	12.2	13.4
Sandveld	lb. D.M.	1,560	2,200	3,340	4,190	4,460
	C.P.%	6.3	6.8	14.2	16.2	16.7
Thornveld	lb. D.M.	1,960	3,540	3,820	4,430	3,330
	C.P.%	5.3	8.1	12.4	13.7	15.9

TULI

At Tuli a very dry summer was followed by heavy late rains which resulted in a good growth of green grass. This lasted until well into the dry season and the steers should, therefore, winter well at stocking rates in excess of one beast to 15 acres.

The heavily stocked paddocks were all so denuded towards the end of the 1962 dry season that the cattle had to be removed to save their lives. Some of these paddocks could not be restocked until the end of January 1963.

The cattle in the cleared paddocks still show a great advantage over those running in undisturbed veld. Two-and-a-half-year-old animals stocked at 1 : 20 in cleared paddocks weighed 1,130 lb. in August 1963, nearly 100 lb. heavier than others stocked at 1 : 30 in bushveld.

Preliminary results of a ring-barking trial on a wide variety of lowveld trees are extremely promising. Goats continue to have a devastating effect on woody species and are definitely worth consideration in any bush control programme in the lowveld.

NYAMANDHLOVU

At Nyamandhlovu the staff are co-operating with Messrs. K O P and the committee of the Lower Khami Intensive Conservation Area in a herbicide screening trial on *Dichapetalum.* The first spray was carried out during October 1962.

Bush control trials with chemicals and hand labour have been continued. Over 100 acres of lightly invaded hay land has been grubbed and over 40 acres of woodland ring-barked. Two small basal bark trials with *A. nilotica* and *Dichrostachys* were also started.

The first of a series of experiments to measure competitive effect of woody growth on the underlying grass cover was laid out in dense *Terminalia sericea* secondary growth. First results will become available during 1964. The programme of dry-season grazing trials with protein supplements on the black basalt has not been continued.

The results from the grazing trials are as follows:

The two all-year stocking rate trials were restocked at the beginning of January with similar animals.

Exp. 15	1 : 6	1 : 10	1 : 20	1 : 30
Gain in summer	153lb.	180	195	207
Loss to 11th Sept.	89lb.	72	42	74

Exp. 24	1:4½	5¼	6	7½	9	11¼	15	18¾
Gain in summer	199	182	153	205	178	227	252	228
Loss to 11th Sept.	93	77	78	84	65	73	45	79

The high incidence of ephemeral fever during the summer may account for the variable results. All animals in both trials lost weight for a period during the summer.

MELSETTER

At the Eastern Highlands Research Station it is of interest that the summer weight increase in the stocking rate trial on veld was highest at the greatest stocking rate but during the winter this pattern was reversed. It is too early to tell what effect the stocking rates will have on the veld, but already cattle tracks are appearing which may lead to erosion on such steep slopes when the rains arrive.

The production of Kikuyu/clover pastures receiving no artificial nitrogen, measured in terms of beef steer live-weight gains, is very satisfactory and it is probable that these returns can be improved by the addition of sheep to the stocking. When yearling steers grazed a pasture without sheep during the 150-day summer period beginning on the 7th December, the live-weight increase per acre was 337 lb. For the first half of this period the stocking rate was two steers to the acre and for the second half 1½ steers to the acre. Results indicate that for optimum utilization of the grass production the stocking should be 1 : 1, with sheep brought in as well. The number of sheep per acre will vary with the season and the condition of the pasture, but from observation so far, it can carry at least three, and possibly more. Whereas the steers move to winter pastures in May, the sheep remain and do well on the Kikuyu/clover pastures throughout the winter period. This not only increases the overall output per acre but is beneficial to the pasture in that the overburden of old material is reduced and a more rapid growth follows when the rains begin.

The performance of beef steers on pasture at Melsetter is very heartening.

One individual weighing 325 lb. as a weaner in mid-October scaled 1,273 lb. 19½ months later. This steer graded Rhodesia's Best with a carcass of 662 lb. cold dressed weight. The average daily weight gain over the whole period was nearly 1¾ lb.

PASTURE GRASS SEED

Sales of Pasture Grass Seeds by the Salisbury Farmers' Co-op for the 1962-63 season were as follows:

	Certified seed	*Uncertified seed*	*Total*
Katambora Rhodes Grass	73,678	2,099	75,777
Giant Rhodes Grass	29,784	2,402	32,186
Sabi Panicum	13,128	nil	13,128
Ermelo Weeping Love Grass			21,248

(Total for Ermelo Love Grass includes Certified seed, Uncertified seed, and Imported seed. No seed of Katambora Rhodes Grass, Giant Rhodes Grass or Sabi Panicum was imported.)

Total amount of seed sold since 1954 is as follows:

	Katambora Rhodes Grass	*Giant Rhodes Grass*	*Ermelo Weeping Love Grass*	*Bambatsi Panicum*	*Sabi Panicum*	*Total*
1954-55	2,999	1,581	—	1,016	—	5,596
1955-56	10,355	3,496	—	1,515	—	15,366
1956-57	23,101	4,044	25,219	1,770	—	54,134
1957-58	36,561	3,535	16,380	861	—	57,337
1958-59	60,889	6,332	28,607	1,412	96	97,336
1959-60	55,831	29,520	25,671	263	461	111,746
1960-61	82,356	15,217	28,199	10	1,804	127,586
1961-62	69,161	24,276	31,232	—	6,764	131,433
1962-63	75,777	32,186	21,248	—	13,128	142,339
TOTAL	417,030	120,187	176,556	6,847	22,253	742,873

The demand for both Katambora Rhodes Grass and Sabi Panicum was greater than the supply. The Farmers' Co-op. estimate the shortfall of Katambora Rhodes Grass seed at about 8,000 lb.

CONFERENCES

The Annual *Pasture Research Officers' Conference* was held at Grasslands Research Station on 15th and 16th August 1963. This was a very successful conference at which eight most interesting papers were read. Some of these papers will be published in due course in the *Rhodesia Agricultural Journal*. A roneoed report of the conference is available from the Chief Pasture Research Officer.)

GENERAL

During the year the Chief Pasture Research Officer served on a number of liaison, co-ordinating and departmental committees. He lectured at meetings of the following organizations:

1. The Natural Resources Board.
2. The Gwaai Group of I.C.A.s.
3. Cashel I.C.A.
4. Trelawney Farmers' Association.
5. Marlborough Intermediate Young Farmers' Club.
6. Wild Life Conservation Course at the University College.
7. Discussion Group on Border Clearing at Chipinga.
8. Sinoia Group of I.C.A.s.
9. Lomagundi Farmers' Association.

He toured the following intensive conservation areas with Conex officers: Nyamandhlovu, Inyanga, Cashel, Chipinga, Angwa North, Ayrshire South, Umtali and the Himalayas, Darwendale and Beatrice.

He accompanied the Ecologist, Kafue Basin Survey, on a tour of the Kafue Flats, and assisted the Department of Conservation and Extension, Department of Veterinary Services, the Southern Rhodesia Government Department of Wild Life Conservation, the Roads Department and other Government departments in various ways.

REPORTS AND PUBLICATIONS BY THE CHIEF PASTURE RESEARCH OFFICER

1. 'Proceedings of the First Interdepartmental Conference of Pasture Workers', edited by the C.P.R.O. (118 pages, roneoed, obtainable on application).
2. 'Factors affecting the Carrying Capacity of Veld Grazing' (in (1) above, pp. 6-22).
3. 'Guide to the Writing of Ecology Papers' (5 pages, roneoed). For Department of Conservation and Extension.
4. 'How the Tobacco Grower should Establish Leys'. *Rho. Tob. Jnl.*, 15, 4, pp. 49-51.
5. 'List of Grasses in the Plant Introduction Nursery at the Grasslands Research Station, Marandellas' (18 pages, roneoed, obtainable on application).
6. Veld Management (in Handbook of the Federal Department of Conservation and Extension, pp. 1-7).
7. 'Notes on the Wattled Crane' (in *Ostrich*, June 1963, pp. 63-77).
8. 'Report of the Sub-committee on Bush and Bush Encroachment' (in *African Soils, B.i.S.* 7, 3, pp. 301-312).
9. 'Review of the Work of the Pasture Branch', a report to the Director of Research and Specialist Services (17 pages, roneoed).
10. 'A Review of Burning, its Effect on Vegetation and Use in Veld Management' is being prepared for *Herbage Abstracts.*
11. Press releases on Veld Burning, Pasture Legumes and other subjects have been prepared by the C.P.R.O. and published in the daily and agricultural press. (Papers published by members of the Pasture Branch are listed in the reports from the research stations.)

BOTANY, PLANT PATHOLOGY AND SEED SERVICES

INTRODUCTION

There were some staff difficulties during the year. The Seeds Research Officer, Mr. C. Coburn, resigned from the Branch on 30th April and has not yet been replaced. It has also proved quite impossible to fill the vacant post of Weeds Research Officer. On the other hand, the vacant post of Systematic Botanist has been filled by the appointment as a temporary officer, of Mrs. L. K. Crook. This appointment enabled the Branch to catch up on the backlog of grass naming as also did the employment of two women officers and a university student for varying periods during the year.

Dr. G. R. Bates acted as Assistant Director of Research and Specialist Services for one period in the first half of the year. He also attended the eighteenth session of CCTA at Dar-es-Salaam in February and during the same month the third World Tobacco Science Congress in Salisbury, followed by the first World Tobacco Trade Congress. In August he left the Branch to take up duty as a member of the Public Services Board of the Southern Rhodesia Government.

Dr. H. Wild was appointed Acting Chief Botanist and Plant Pathologist from 17th September.

Dr. Wild paid visits to Tete Province of Portuguese East Africa in October 1962, Northern Rhodesia in November and Nyasaland in May in connexion with the preparation of a Vegetation Map of the Flora Zambesiaca area which he is compiling with Professor L. A. Grandvaux Barbosa, of the University of Luanda. His visit to Nyasaland was also concerned with discussions on Nyasaland's future part in the Flora Zambesiaca project. Subsequently he attended the fifth Plenary Session of *l'Association pour l'Etude de la Flore d'Afrique tropicale*, which was held at Genoa and Florence. He also spent two weeks working in the Herbaria of Kew, the British Museum and the Imperial Forestry Institute, Oxford.

During the year both Dr. J. O. Whiteside and Mr. A. Rothwell were awarded FAO fellowships tenable in the United States of America, and Mr. Rothwell also spent some time on study leave at the Commonwealth Mycological Institute, Kew. Mr. Rothwell has been studying mycological techniques and methods at the Commonwealth Mycological Institute in order to improve the identification service on his return to Salisbury, whilst both he and Dr. Whiteside are also studying various aspects of the cultivation in the United States of America of alternative crops to maize and tobacco from the disease point of view. They are concentrating on such crops as soya-bean, cotton, groundnuts and castor bean. Mr. Rothwell is also spending some time on an investigation of American extension methods in the Plant Pathological field.

Mr. W. E. Kerr, Officer-in-Charge, Seed Services, presented a paper to the Professional Officers' Conference held at Gwebi entitled 'Seed Production in relation to Climate' and also gave a course of lectures at Gwebi. In company with the Chief Entomologist he also held discussions with the Portuguese authorities in Beira to resolve problems arising in regard to the fumigation of seeds for export.

Volume 3 of *Kirkia*, the official Journal of the Federal Herbarium, was published in April 1963 and volume 2, part 1 of the *Flora Zambesiaca* was published in May 1963. Details of scientific articles published by individual members of the Branch appear in the appropriate sections of the following report.

BOTANY

HERBARIUM

Accessions of 9,050 specimens were made during the year which is approximately the same as that recorded for last year. Some 1,500 named duplicates have been received from other Herbaria, principally from Kew, Lisbon and Pretoria. Over 7,000 duplicate specimens have been distributed for study to 35 different institutions in various parts of the world. Some 7,500 determinations were made for various institutions and individuals. This is a considerable increase on last year and included 3,600 determinations for Government departments in Northern Rhodesia. Departments who made use of the Branch's services in this way during the year included:

Conservation and Extension
Entomology
Pasture Research
Education (Heany Teachers' Training College, etc.)
Health (Bilharzia Research)
Tsetse Control
Wildlife Conservation
Southern Rhodesia Department of Agriculture
Department of Agriculture of Northern Rhodesia
Forestry Department of Northern Rhodesia
Department of Game and Fisheries, Northern Rhodesia
Joint Fisheries Research Organization
Department of Agriculture, Nyasaland
Forestry Department of Nyasaland
Agriculture Department of Bechuanaland

Material was also named for the Forestry Commission of Southern Rhodesia, International Red Locust Control Service, FAO Ecologist, Kafue Basin Survey, National Museums of Southern Rhodesia, Rhodes-Livingstone Museum, Rhodes-Livingstone Institute and the Chemistry and Botany departments of the University College of Rhodesia and Nyasaland.

An important collection, made by the Cambridge University Expedition to Central Africa 1962, in the Mweru Wantipa and Nyika areas was determined, and important material was received from the Wankie, Mount Darwin, Pungwe Gorge, Matopos, Shashi River, Mwinilunga and Mount Mlanje areas.

The *Lantana* material, sent for special study and checking to Kew, has now been returned as has a selection of the *Hibiscus* material sent to Florida.

With the publication of volume 2, part 1, of the *Flora Zambesiaca*, volume 2, part 2, is being prepared for the press and is expected to go to the printer in about March 1964. Work has continued on the Rhamnaceae for this part of the flora in Salisbury and Dr. Wild is engaged in work on the Compositae, a family which will take some years to complete. He has recently completed a revision of the composite genus *Anisopappus*, which will be published in *Kirkia*. Dr.

Launert, of the British Museum Flora Zambesiaca staff, expects to have the first part of the Grass volume ready for the press in about one year.

The Vegetation Map of the Flora Zambesiaca being prepared by Dr. H. Wild and Professor L. A. Grandvaux Barbosa, of Luanda University, is now nearing completion. The map is drawn and most of the accompanying text written but the achievement of complete compatibility between the Moçambique part of the map and the remainder will take some time.

Sufficient articles to fill volume 4 of *Kirkia* have now gone to press and the benefits received from the exchange of this journal with those of other botanical institutions has continued to increase. The library continued to grow accordingly and during the year a card index of all items was completed for the first time.

Towards the end of the year a considerable amount of time was spent in preparing the move to the new Herbarium building in Alexandra Park which took place on 31st October 1963.

BOTANIC GARDEN

The Nursery buildings planned for propagation-work, storage, etc., have now been completed and will enable the Branch to organize its own propagation programme adequately for the first time.

Labour was provided by the Federal Prisons Department during October to December 1962 and again from July 1963 to date, and this enabled a remarkable amount of development work to be carried out, especially around the Herbarium building. Many hundreds of tons of stone were dug out and this made possible mechanical cutting over a very large area. Some 250 five-ton truck loads of stones were actually removed from the garden but many still remain to be dealt with. Levelling of scarred and eroded ground also made good progress.

Some 180 bags of couch grass were planted to improve the grass cover and more than 200 indigenous trees planted in the southern part of the garden. Work was also begun on the development of a small 'forest' area. Plans are now being drawn up for road development and extensions to the water reticulation system during the coming year.

The seed exchange programme with overseas botanic gardens and locally is growing, some 580 seed samples having been received from various sources so far.

ECONOMIC BOTANY

Weeds.—This aspect of the Branch's work continued to be sorely handicapped by inability to fill the post of Weed Research Officer. Nevertheless a steady flow of queries on this subject was dealt with and, in particular, advice was regularly given on the eradication of *Lantana, Opuntia* (cactus), *Cyperus esculentus* (water grass) and blueweed (*Euphorbia prostrata*).

Poisonous Plants.—More paintings have recently been completed for the article being jointly prepared with the Veterinary Research Department. Many plants suspected of being poisonous have also been determined for this Department. Two interesting cases in connexion with cattle poisoning came to light. One was a case of prussic acid poisoning in cattle caused by them having eaten Barberton daisies (*Gerbera jamesonii*) and another a case of *Lantana* cattle poisoning in the Beatrice district.

Cases of human poisoning dealt with were more numerous than usual and the following plants were identified in connexion with investigations being carried out by the police: *Urginea altissima. Dalbergiella nyasae, Securidaca longipedunculata, Monadenium lugardae* and *Aloe gobuligemma.*

Medicinal Plants.—The Herbarium continued to assist with a project jointly organized by the Rhodes-Livingstone Museum and the Squibbs Institute of Medical Research. The plants concerned were collected in Barotseland.

VISITORS

Many local botanists worked in the Herbarium during the year and the following visitors from outside the Federation made use of its facilities: Professor L. A. Grandvaux (University of Luanda — flora of Angola, etc.), Professor W. H. Lewis of the University of Texas (cytological research in the Rubiaceae), J. B. Phipps (University of Western Ontario, taxonomy of Arundinelleae), Professor W. W. Huffine (Oklahoma State University—*Cynodon*), H. J. van Rensburg (FAO ecologist, Kafue Basin Survey).

PUBLICATIONS

(1) *Flora Zambesiaca* volume 2, part 1, ed. A. W. Exell, A. Fernandes and H. Wild, 1963, Crown Agents for Overseas Governments.

(2) 'A preliminary account of the Plant Ecology of the Chimanimani Mountains,' by J. B. Phipps and R. Goodier. *Journ. Ecol.* 50 (1962).

(3) 'Vitaceae from the Flora Zambesiaca Area: 3', by H. Wild and R. B. Drummond, *Kirkia* 3 (1963).

(4) '*Ischaemum roseotomentosum*, a new species in the Graminae from Southern Rhodesia', by J. B. Phipps, *Kirkia* 3 (1963).

(5) 'The New Alexandra Park Botanic Garden and Government Herbarium Building, Salisbury,' by H. Wild, *Kirkia* 4 (1963).

PLANT PATHOLOGY

ADVISORY

Laboratory work was severely affected during the year by the absence of two plant pathologists on FAO fellowships in the United States of America. Nevertheless some 1,000 specimens were dealt with in the Umtali and Salisbury Laboratories (1,214 in 1962) and 110 new diseases or host records obtained. This latter figure actually shows an increase over last year of 30 records. This is probably due to the increasing experience and efficiency of the plant pathologists rather than to any marked increase in the number of diseases or their incidence. Of the new records the following deserve special mention: pokkah boeng disease of sugar cane caused by *Fusarium moniliforme* Sheldon, head smut of *Cleistachne sorghoides* caused by *Sphacelotheca reiliana* (Kühn) Clint, bacterial leaf spot of sunflowers caused by *Pseudomonas* sp., anthracnose of soya-bean caused by *Colletotrichum* sp. and *Fusarium oxysporum* var. *nicotianae* on Burley tobacco. Additions to the host range of the root-rotting fungus *Armillaria mellea* (Fr.) Quel. include Mlanje Cedar (*Widdringtonia whytei*) and the Grenadilla.

[Passiflora quadrangularis]

TOBACCO

Tobacco vein browning virus, a strain of Potato Virus Y, was found on several crops of flue-cured and Burley tobacco in the Arcturus/Enterprise area. Whilst the loss caused by the disease even on the worst-affected crop was not serious, the appearance of the virus in this area, where both tobacco and potatoes are important crops, has caused concern. It is felt that collaboration between the Tobacco Research Board, the Tobacco Extension Service and the Plant Pathology Branch should be sought in order to carry out intensive surveys of the incidence of the disease throughout the country. Arrangements have been made to plant plots of Burley tobacco in summer potato crops in order to find out whether potatoes are acting as reservoirs of infection for tobacco.

One case of anthracnose was recorded in seed-beds at Odzi on a site which had been used for several years running. Wildfire and the blackfire form of angular spot caused serious damage on a few farms located in the cooler areas of Rusape and Macheke.

Comparatively little bushy top virus appeared for the second year running, even on late-planted crops.

Several outbreaks of leaf curl virus occurred on Burley tobacco trial plantings in the Chipinga area. The fact that this area receives a certain amount of winter rainfall and that much of the vegetation remains green through the dry season may allow the virus to carry through the dry season on some indigenous host plant. Another possibility is that there may be sources of infection from tobacco grown all the year round in nearby tribal reserves.

POTATOES

Late blight did not appear at Salisbury until the end of December but after its appearance it developed rapidly with the favourable weather conditions.

In the Umtali area late blight became epidemic by mid-December but in spite of the very wet conditions in November and December it did not become serious at the higher altitudes until early January. It is believed that the more efficient and greater use of motorized knapsack sprayers by the seed-growers at the higher altitudes helped considerably to delay the onset and subsequent development of the disease.

There was a high incidence of black-leg once more in crops grown from freshly imported Scotch Up-to-Date seed.

Early blight was prevalent throughout the year and caused some losses in yield. Another outbreak of bacterial wilt on a crop grown from Melsetter seed was recorded. This source of infection in Melsetter has been noted on several previous occasions and steps will be necessary to prevent further spread from this source.

MAIZE

Leaf blight was more in evidence in the 1962/63 summer than of recent years and was reported as severe in some areas. Streak virus was of little consequence. An extremely severe outbreak of cob rot caused by *Diplodia zeae* occurred at Mazoe.

CITRUS

Black-spot.—A re-examination of citrus groves at Mazoe, Hippo Valley and Gwelo confirmed South African findings that two species of *Guignardia* occur on citrus, one of which remains as a latent infection on the leaves, whilst the other (*G. citricarpa*) causes black-spot symptoms. Cultural differences between the two species were observed. No further cases of virulent black-spot were found other than those previously recorded in Gwelo and Bulawayo.

Oranges of the Premier variety grown at the Premier Citrus Estates developed brown areas on the rind about 10 days after harvesting thus rendering them unsuitable for export. These symptoms appeared mostly towards the stem button end of the fruit. The condition appeared to be associated with rapid loss of water from the rind but the actual cause of the disorder is not known at present.

DWARF BEANS

Although the majority of the crops grown this year for the local canning factory remained healthy, there were a number that developed serious anthracnose and this led to a suspicion amongst growers that the seed supplied to them this year might have been infected. This seems to be a most unlikely explanation since the seed was obtained from Sabi lowveld crops which were inspected and found free from seed-borne diseases the previous dry season. It seems more likely that the sporadic outbreaks were due to local sources of infection on the farms concerned and it would have taken only a trace of inoculum to account for these outbreaks, since the climatic conditions over much of the cropping season were extremely favourable for infection and disease spread.

DECIDUOUS FRUIT

The spray schedules in current use for the control of deciduous fruit diseases have in most instances given satisfactory results and in spite of the very wet season very few serious disease outbreaks occurred. This can also be attributed to more efficient spraying and the increased use of power sprayers.

Only a trace of scab (*Venturia inaequalis*) developed on the fruit this year in the apple orchard at Melsetter, where heavy losses occurred the previous year on the varieties White Winter Pearmain and Carrington.

With the assistance of Miss C. Ellenberger, a research virologist from East Malling Research Station, a survey was carried out to determine the incidence of virus disease in commercial plantings of deciduous fruit. Whilst apple mosaic is very prevalent and is undoubtedly having a pronounced influence on tree vigour in certain varieties, the present position on stone fruits is apparently not nearly so serious as it is on apples.

COFFEE

Berry blotch, due to *Cercospora coffeicola*, was prevalent and gave rise to concern amongst some growers. Infection resulted in earlier colouring and the disease developed mostly on berries exposed to the direct rays of the sun, particularly where they were exposed during the early afternoon. The incidence of this disease decreased considerably on the later pickings.

TEA

Investigations carried out on the cause of transplanting failures at Eastern Highlands Tea Estates revealed that fungus attack was not primarily responsible. Although many of the stems were extensively colonized by *Botryodiplodia theobromae*, this probably occurred after the plants had become weakened, due to failure of the root stumps to produce new roots.

SUGAR-CANE

An outbreak of smut was first discovered in October in the Variety Introduction Nursery at the Sabi Valley Experiment Station. The varieties infected were N Co's 334 and 382, and Co's 331, 419 and 432.

At the Triangle and Hippo Valley Sugar Estates the incidence of smut is generally low, but is tending to become serious on the susceptible variety N Co 310 after a number of ratoonings.

FORESTRY

Due to the renewed interest by the Southern Rhodesia Forestry Commission in the possibilities of planting further areas to *Pinus radiata*, investigations have been intensified on needle blight disease caused by *Dothistroma pini*. Below the mist belt at Stapleford, heavily infected seedlings made an excellent recovery whilst at higher altitudes the disease is still very severe and is causing death of young trees.

RESEARCH

WHEAT

General.—Stem rust (*Puccinia graminis tricici*) was first seen at Salisbury during the summer on 26th February, over a month later than the previous year. This was probably due to the lack of inoculum carrying over from the previous winter when rust was negligible generally throughout the country. Both stem and leaf rust developed rapidly after they appeared and afforded a good opportunity for the assessment of varietal resistance. A commercial crop of the variety Marodzi at Que Que was not affected by rust. In the winter crop, conditions were more favourable than in the previous winter and the disease developed fairly rapidly in the Fort Victoria, Mazoe Valley, Sabi and Salisbury districts. In the Mazoe Valley Marodzi was severely attacked and consequently the variety will have to be withdrawn. The variety Mazoe withstood attacks at Glendale, reacting generally with resistant-type pustules, but the occurrence of scattered susceptible-type pustules indicates the presence of a race to which Mazoe is susceptible. The variety Gabo in the Sabi area was also severely attacked and this variety also will probably be withdrawn. Kafue, although resistant to stem rust, showed a change in its reaction to stem rust at Salisbury during the summer—whereas in previous years Kafue was immune to attack, it now shows resistant-type pustules. F430, which is one of the main sources of resistance, has remained immune to all the race changes which have obviously taken place and it is expected that crosses involving this variety (e.g. Kafue x F430, S29A1X v 430, etc.) will provide protection against rust for some time to come.

International Spring Wheat Uniform Rust Nursery.—This nursery consists of 829 varieties and was planted at Salisbury on 12th December. Heavy rain in late December caused severe surface washing, resulting in a reduction in stand in some varieties. Despite the late appearance of rust, the disease developed rapidly and enabled good assessments for resistance to be made. On the standard varieties in the nursery, readings were similar to those of the previous year, although the general amount of rust was less.

The Inter-African Uniform Rust Nursery was also planted on 12th December at Salisbury and the results were forwarded to the Plant Breeding Station, Njoro, for comparison with results from other African territories.

GRAPE VINES

A spray trial designed to compare the effectiveness of Bordeaux mixture, zineb, maneb and thiram against anthracnose was carried out at Brooklands Farm, Old Umtali, on the late-maturing variety, Issor.

For the second season running, thiram and Bordeaux mixture were about equally effective against anthracnose in the Old Umtali district. Thiram is now preferred, at least for the areas with more moderate rainfall, because it has a number of practical advantages over Bordeaux mixture. Thiram leaves a less conspicuous deposit on the berries and can be safely mixed with most other spray materials. It also causes less wear on spraying equipment and can be applied at high concentrations through low-volume spraying machines.

PEACH

A trial designed to compare the efficiency of low- and high-volume applications of zineb for the control of peach rust was carried out at Shinda Orchards.

The results indicate that both methods of spraying were satisfactory for controlling rust. Considering that only two applications were given and that the rainfall this season was exceptionally high, particularly during February, the treatments provided a surprisingly effective control of rust as measured by the reduction in rate of defoliation.

PUBLICATIONS

'Wheat Diseases,' by G. W. Herd, Technical Publications No. 1, *Rhod. Agr. Journ.*, July-August 1963.

SEED SERVICES

INSPECTION SERVICE

871 visits were paid to farms in Southern and Northern Rhodesia concerned with crop certification or approval, including advisory visits and the investigation of complaints on the quality of seed stocks. 593 visits were paid to merchants handling seeds for the purpose of enforcing seed legislation and also to farms for the sampling of seed in terms of the procedures laid down for certification.

LABORATORY

2,614 seed samples were received for examination, including 71 samples submitted specifically for disease tests associated with the issue of phytosanitary certificates. This amounted to an increase of 4 per cent. over the previous year. In all, 6,229 germination tests were carried out, including routine and investigational work but excluding physiological studies undertaken by the Seeds Research Officer.

47 per cent. of all samples received were concerned with certification and 19 per cent. from other branches and sections of the Ministry.

21 Orange International Certificates, 237 International Phytosanitary Certificates and 42 Certificates of Wholesomeness were issued. The latter were prepared in conjunction with the Chemistry Branch and concerned groundnuts for edible purposes.

Because of the pressure of work, referee testing for the International Seed Testing Association had to be abandoned.

LEGISLATION

In all, 48,300 lb. and 3,967 packets of various prescribed seeds were sampled during the year in terms of the Seed Regulations, 1953. In addition 53 lb. and 6,435 packets were seized and destroyed because they did not conform to requirements.

Nine per cent. of all samples received for purity and germination test were rejected as being below standard. 472,536 lb. of various seeds intended for export were officially sampled and sealed in accordance with international procedure for the issue of Orange International Certificates.

CROP INSPECTION AND CERTIFICATION

6,794 acres of various seed crops were registered, including all the major Rhodesian crops, and various vegetables and flower seed stocks intended for export, but excluding maize. An estimated 3.7 million lb. weight of seed was produced, excluding the production of 1.9 million lb. of potato seed. Apart from the rejection of 22.5 per cent. of seed potatoes it is not yet known what percentage of other seed products will fail to meet certification standards or the minimum set by seed legislation.

Seed potatoes.—678 acres were entered for certification, of which 55¾ acres were rejected. 13,111 bags (150 lb.) of seed were inspected for grading and tuber defects. Of this total 2,954 bags were rejected for certification purposes.

Production in the 1962/63 period more than doubled as compared with the previous year. For the first time the quantities of certified seed produced was sufficient to meet the national requirements and importations were severely curtailed. The occurrence of the tobacco veinal necrosis strain of virus Y in Rhodesia necessitated the introduction of regulations governing potato production in tobacco areas. A careful watch is being maintained on potato seed crops to minimize the danger of spread.

Tobacco seed.—Out of a total of 29 growers 17 produced certified seed. 5,437 lb. of seed were sampled of which 128 lb. subsequently failed to meet the necessary standards. 19,484 oz. are currently held in the seed bank.

Pasture seed.—1,351½ acres of grass and legume crops were inspected from which 66,500 lb. of seed were produced.

The exceptionally dry weather in March and April reduced yields and the overall total production was some 30 per cent. less than the anticipated crop.

Available evidence suggests that smut is building up the Sabi Panicum; the situation is being carefully watched.

Wheat seed.—Three varieties of wheat were inspected, totalling 383 acres, of which all but 170 acres was Mazoe and Marodzi. Seventy-eight acres were rejected on the grounds of admixture.

Barley.—Sixty-one acres of Californian Atlas were inspected and rejected because of varietal contamination.

Sorghum.—A scheme for the certification of sorghum was introduced at the request of sorghum growers. In the initial year 770 acres were inspected, of which 213½ acres were rejected.

Soybean.—A certification procedure was introduced for seven varieties and 24 acres were inspected for this purpose. In addition 497½ acres were examined for approval of which 28 were rejected.

Groundnuts.—494 acres were inspected comprising the four major varieties, Natal Common, Valencia, Virginia Bunch and Makulu Red. The quality of seed stocks has improved materially since the introduction of a certification procedure.

Peas and Beans.—2,258 acres were inspected for the purpose of phytosanitary certificates of which 200 acres were peas. 206 acres of beans were grown in Moçambique and special authority was obtained for a seeds officer to visit the crops. The incidence of bacterial blight and anthracnose was disturbingly high and, to some extent, was due to poor stock seed being supplied to the growers.

Other vegetable seeds.—133½ acres of other vegetable crops were produced of which 118 was lettuce. Lettuse mosaic was recorded in five crops.

Flower seeds.—Thirty-three acres of flower seed crops were grown, representing fifteen different varieties and types. The majority of the seed is being grown for the American market.

Miscellaneous crops.—Ninety-three and a quarter acres of velvet beans, cowpeas, sunflower and Jack beans were registered for inspection. Forty-four acres were rejected because of various defects.

Maize seed.—Despite the high incidence of *Diplodia* infection in maize during the 1962/63 season, due mainly to late rains, the level of infection in certified seed was only 0.6 per cent. This compares more than favourably with previous years. Treatment of seed with a fungicidal/insecticidal dressing is still not as effective as it should be.

RESEARCH AND INVESTIGATIONS

Maize for pot trials.—In the maize greencrop rotation trial, results obtained in the 1962/63 season were inconclusive, as in previous years, and indicate that the fertility level is of more importance than the actual rotation followed.

Maize seed dressing trial.—Fifteen commercial seed dressings were tested on three different planting dates. No significant differences were recorded either in emergence or seedling weight. Treated seed held in storage for a period of one year showed no reduction in emergence or vigour when compared with results from a trial planted immediately after treatment.

Groundnut seed dressing trials.—Seventeen commercial seed dressings were tested with various sowing dates. All treatments proved to be significantly better than the control with an average increase of 60 per cent. germination for dressed seed as compared with undressed seed. Some dressings appeared to be more effective than others initially but at the time of the final emergence count the differences were not so apparent. Copper hydroquinolate, which has been specifically recommended for groundnuts elsewhere, again proved to be the least effective when compared with mercurials, TMTD and copper-based dressings. Again, treated seed held in storage for one year showed no ill effects resulting from any of the dressings used.

Groundnut seed size experiment.—Four different grades of Valencia groundnuts were planted in a field experiment. The smallest seed (roughly 14/64ths of an inch in diameter) gave the highest plant counts.

Soya bean variety trials.—Nine varieties were included in trials conducted at two different sites. The best varieties in grain yield were Hood, Columbia M8A, Lee and Hemen 147, in that order.

PUBLICATIONS

Hanssen K. B.—'Seed Control — Meaning and Purpose behind Testing and Certification'. *Rhod. Agr. Journ.*, 60, No. 1, January-February 1963.

Humphreys, J. R.—'Protecting our Country's Potato Crop'. *Rhod. Agr. Journ.*, 59, No. 6, November-December 1962.

Humphreys, J. R.—'Seed Certification and what it Means to Agriculture'. *Rhodesia Farmer*, 33, No. 25, October 1962.

Humphreys, J. R. and Garmany, H. F. M.—'Rhodesia could be a World Tobacco Seed Supplier'. *World Tobacco*, 1, No. 1, June 1963.

Kerr, W. E. and Humphreys, J. R.—'Lettuce Seed Production'. *Rhod. Agr. Journ.* 59, No. 6, November-December 1962.

Kerr, W. E.—'Flower Seed Production'. Pamphlet for distribution to seed growers.

Bates, G. R.—'Certified Tobacco Seed'. *Commonwealth Phytopathological News*, 9, Part I, 1963

Bates, G. R.—'New All-purpose Seed Machine now Available'. *Rhodesia Tobacco Journ.*, 15, No. 6, June 1963 (based on information supplied by W. J. N. Bichard, Seed Services).

CHEMISTRY AND SOIL SCIENCE

GENERAL REVIEW

A number of staff changes occurred during the year, some of which resulted in a marked alteration of the structure of the Chemistry Branch. Dr. D. H. Saunder and Dr. P. M. Grant were loaned and seconded respectively to the Agricultural Research Council of Rhodesia and Nyasaland to form the nucleus of a Soil Productivity Research Unit, stationed at the Grassland Agricultural Research Station and with Dr. Saunder as leader. Dr. J. W. Thompson, Spectrographer, was transferred to the BSA Police as forensic scientist. Mr. B. D. Soane, Senior Soil Physicist, resigned and his post was filled by the promotion of Mr. H. R. R. Metelerkamp. Though several Professional and Technical Officers were newly appointed, two Professional Officers' posts and one Laboratory Assistant's post were vacant at the end of the year.

The total number of samples analysed and reported upon by the General Analytical Section and by the Soil Testing Section is shown in Table I, together with the corresponding figures for the two previous seasons.

TABLE I

NUMBER OF SAMPLES ANALYSED

(For Period from 1st October 1962 to 30th September 1963)

	1962/63	*1961/62*	*1960/61*
General Analytical Section	4,747	3,011	3,578
Soil Testing Section			
Advisory	4,386	3,929	3,715
Investigatory	1,385	1,278	1,294
TOTAL	10,518	8,218	8,587

Compared with the preceding years, the number of samples analysed increased in both sections. For the General Analytical Section this increase amounted to 1,736 samples or 58 per cent., and was essentially due to the fact that the posts of seconded Technical Assistants at the Henderson and Matopos Research Stations were occupied for only part of the year so that many routine analytical determinations which ordinarily would have been carried out at the stations, were done at the Salisbury laboratory. This situation should be rectified early in the coming year, when each of the three major research stations will have a seconded technical officer whose task it will be to do the bulk of the routine analytical work on the spot but under the supervision of this Branch.

Of the 4,747 samples analysed by the General Analytical Section, 4,497 (i.e., 95 per cent.) were submitted by research stations and other Government departments, and only 250 samples were analysed for private persons and organizations. For the research stations of the Department of Research and Specialist Services, 2,551 samples (mainly plant materials, feeds and faeces) were analysed, 878 samples (mainly toxicological specimens and blood and serum samples) were submitted by the Veterinary Department, 80 miscellaneous samples by the Department of Conservation and Extension and 121 samples (mainly waters) by the Southern Rhodesia Ministry of Agriculture and the Hydrological Branch of the Southern Rhodesia Division of Irrigation and Lands. Under the provisions of the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1952, 144 fertilizers, farm feeds and agricultural liming materials were sampled and analysed. No serious infringements of the regulations were noted during the year.

Decided progress has been achieved in the field of fertilizer legislation. Amendments to the Agricultural Liming Materials Regulations became operative at the beginning of 1963, and new fertilizer regulations, as well as regulations dealing with the sterilization of animal products, were published in the *Federal Government Gazette* towards the end of the year under review.

The output of the Soil Testing Section, in terms of samples analysed and reported upon, increased by 11 per cent. as compared with last year's output. Of the 5,771 soil samples analysed during the year 4,386 were advisory samples, and 84 per cent. of the latter were from Southern Rhodesia, 15.7 per cent. from Northern Rhodesia, and a small number from foreign countries; none were received from Nyasaland. As in previous years, flue-cured tobacco and maize were again the main crops for which fertilizer recommendations on the basis of soil analysis were required, accounting together for 58 per cent. of all advisory samples.

The demands from farmers as well as research stations for the services provided by the Soil Testing Section have been increasing at a steady rate over the past years, and a point has been reached now when careful consideration must be given to improve facilities of the laboratory so as to deal effectively with the increased demands. These include requests for the analysis of large numbers of soil samples submitted by agricultural officers in the African areas, and proposals for an expansion of the laboratory have been put forward.

The Soil Survey Section carried out seven major and several minor soil surveys during the year. The former included two surveys on sugar estates to assist the companies in the development of new areas for growing sugar cane, and four surveys on Crown land and in African areas to explore their irrigation potential. The section continued to collaborate with the Department of Conservation and Extension in their farm-planning work, more particularly through three pedologists seconded to that Department.

The senior officer-in-charge of the Soil Survey Section, Mr. J. G. Thompson, was nominated convenor of a newly constituted SARCCUS Standing Sub. committee on Soil Science, and organized a meeting at Salisbury preceded by a pedological tour in Southern Rhodesia in September 1963, at which also Messrs. Thomas, Du Toit and Dr. Jaklitsch participated. Mr. Thompson presented a working document, giving an outline of pedological classification in Southern Rhodesia, to the meeting at which pedologists from member countries of SARCCUS discussed pedological classification at all levels, paying particular attention to the higher levels of classification. In addition to drawing up recommendations to be made to the next plenary session of SARCCUS in regard to the functioning of the Standing Sub-committee, recommendations were also made concerning the manner in which pedologists could most effectively assist SARCCUS in dealing with land use and soil conservation problems in Southern Africa.

With the secondment of Dr. D. H. Saunder and Dr. P. M. Grant to the Agricultural Research Council of Rhodesia and Nyasaland, the transfer of the spectrographer to the BSA Police and the subsequent resignation of the Soil Physicist, the Research Section of the Branch has temporarily ceased to function. Research on soil fertility will in future be carried out by the Agricultural Research Council, but it is hoped that this Branch will be able to co-operate in this work with investigations on clay mineralogy and mineral reserves of soils, as soon as the necessary staff are available.

Up to the date of his resignation in May 1963, the Soil Physicist was engaged on investigations of the seasonal fluctuations of soil moisture under crops, on determinations of soil water retention characteristics for various research stations and for Triangle Sugar Estates, and on related problems. Mr. H. R. R. Metelerkamp, who is now filling this post, is seconded to the Sabi Valley Experiment Station and will for the time being continue soil physics research work there. The principal work in the spectrographic laboratory was of an advisory nature and consisted of the analysis of plant specimens to diagnose nutritional disorders. Apart from this, an investigation of the mineral and trace element content of soyabean plants from an experiment at the Salisbury Agricultural Experiment Station was carried out, and considerable assistance was given to the Criminal Investigation Department of the BSA Police.

Until suitably qualified staff can be obtained, it will not be possible to undertake soil physics or spectographic work in the Branch.

An investigation into alleged chronic arsenical poisoning in the Umtali North Intensive Conservation Area, initiated in the previous year jointly with the Department of Conservation and Extension and the Veterinary Department, was continued and brought to a conclusion. No evidence of chronic arsenical poisoning was found and the results of the investigation have been fully reported by the Chief Agricultural Chemist who acted as chairman of a committee concerned with this matter.

Mr. R. G. Thomas, Dr. D. H. Saunder, and Dr. P. M. Grant attended the International Soils Conference in New Zealand, and visited research institutions and stations in Australia. Mr. Thomas and Dr. Saunder presented four papers to the Conference (listed in last year's Annual Report).

Dr. H. Weinmann and Mr. D. G. Bushnell attended the Third World Tobacco Scientific Congress at Salisbury. The Third Regional Conference for Africa on Soil Mechanics and Foundation Engineering, held in Salisbury, was attended by Messrs. Thomas, J. G. and H. G. Thompson, and du Toit.

All professional officers of the Branch attended the Professional Officers' Conference of the Department; two of them presented papers at the Conference, which was organized by the Chief Agricultural Chemist, who also edited all papers and discussion reports for publication.

As in previous years, the Branch actively co-operated with the research stations and agricultural colleges of the Department, with the Department of Conservation and Extension, the Veterinary Department, the Southern Rhodesia Ministry of Agriculture, the Tobacco Research Board of Rhodesia and Nyasaland, and other organizations. Officers of the Branch worked on a number of committees, attended various meetings, and gave lectures to farmers, Conservation and Extension Officers, agricultural students, and others, A number of scientific and popular articles were published or prepared for publication, and are listed at the end of this report.

GENERAL ANALYTICAL SECTION

As mentioned above, a large proportion of the work done by the Section during the year consisted of routine analysis carried out for the research stations, and it was therefore not possible to make a great deal of progress into new fields.

A break-down of the analytical work of the laboratory according to the origin of the samples is shown below:

Chemistry Branch (including official samples)	559
Other Specialist Branches	291
Departmental Research Stations	2,551
Veterinary Department	878
Department of Conservation and Extension	80
Hydrological Branch, Southern Rhodesia Division of Irrigation and Lands	28
Southern Rhodesia Ministry of Agriculture	93
Other Government Departments	17
Private Individuals and Companies	250
TOTAL	4,747

In addition, routine analysis was carried out by seconded Technical Officers on 2,377 samples at the Grasslands Research Station, on 712 samples at the Matopos Research Station and 435 samples at the Henderson Research Station; at the latter two stations the chemical laboratories were in operation for only four and three months respectively. The Technical Officer at Grasslands was also engaged on certain research projects, and the officer at the Henderson Research Station assisted the Animal Husbandry Officer in addition to his routine analytical work.

The collection of monthly radioactive fallout samples for the United States Atomic Energy Commission continued.

Unfortunately, the investigation into the Vitamin A reserves of beef cattle had to be suspended on account of staff shortages, but all the necessary techniques have been established and work could be resumed at short notice.

The principal categories of materials analysed are shown in Table II, and some relevant remarks follow.

Table II

SAMPLES ANALYSED IN THE GENERAL ANALYTICAL LABORATORY

	1962/63	*1961/62*
Fertilizers, Manures and Liming Materials		
Inorganic fertilizers	8	11
Organic fertilizers	14	10
Fertilizers (under the Act)	39	43
Liming materials	50	50
Liming materials (under the Act)	2	5
Miscellaneous fertilizers	3	1
Farm-feeds and Vegetable Products		
Farm-feeds	78	72
Farm-feeds (under the Act)	104	95
Maize	82	31
Other cereals	104	25
Legumes	235	22
Tobacco	0	0
Grasses and hays	1,196	452
Silages	105	18
Other vegetable products	46	352
Animal Products		
Blood samples	275	185
Other animal products	26	37
Feeds and Faeces from Feeding Trials	688	539
Check Samples from Research Stations	69	119
Oils and Oil-seeds	634	213
Essential Oils	1	2
Waters	297	170
Toxicological Specimens		
Analyses for arsenic — positive	145	99
Analyses for arsenic — negative	389	355
Other poisons	60	65
Protection Products		
Arsenical dips	18	15
Organic dips	13	8
Other plant protection products	6	3
Miscellaneous	60	14
TOTAL	4,747	3,011

SAMPLES TAKEN IN TERMS OF THE FERTILIZERS, FARM FEEDS, SEEDS AND REMEDIES ACT, 1952

It has been possible to maintain the same volume of work in the checking of fertilizers, farm-feeds and agricultural liming materials as was established in the past two years. In this year 39 fertilizers, 104 farm-feeds and two liming materials were sampled and analysed.

Only minor labelling discrepancies were brought to light.

FERTILIZERS, MANURES AND LIMING MATERIALS

The number of fertilizer analyses requested remained at a low level but the interest in agricultural liming materials, noted in the previous year, was maintained, particularly with respect to Northern Rhodesia.

FARM-FEEDS AND VEGETABLE PRODUCTS

In this category there was an 85 per cent. rise in the number of samples analysed compared to last year's figures. Over 80 per cent. of the 1950 samples were submitted by the research stations. 27 from Grasslands Agricultural Research Station, 78 from the Salisbury Agricultural Experiment Station, 28 from the Sabi Valley Experiment Station, 488 from the Henderson Research Station and 977 from the Matopos Research Station.

The results of an investigation into the nutrient uptake of wheat, based on a chemical analysis of three varieties of winter wheat grown at the Salisbury Agricultural Experiment Station, have since been published (*see* list of publications, No. 13).

ANIMAL PRODUCTS

The number of samples analysed under this heading rose from 222 in 1961/62 to 301 in the current year. Of this number 275 were blood samples, including 177 sera and plasma samples taken from game animals during 'Operation Noah' on Lake Kariba. Twenty-four blood samples were analysed for the Department of Conservation and Extension in connexion with an aphosphorosis trial that was recently initiated and in which this Branch is collaborating.

Apart from blood samples, analyses were undertaken for Vitamin A and copper in liver samples, iodine value of the body fat of broilers, and total bile acids in ox-gall samples.

FEEDS AND FAECES FROM FEEDING TRIALS

There was an increase in the number of these research samples in the past year, from 549 in 1961/62 to 659 samples. Of these 125 samples were submitted by the Matopos Research Station, 99 by the Grasslands Agricultural Research Station and 435 by the Henderson Research Station.

OILS AND OILSEEDS

Work on this type of material rose from 213 samples in 1961/62 to 634 in the current year. Of this number 141 samples of groundnuts were tested for their moisture content for Seed Services, and 317 samples of groundnuts were checked for fungal infection.

WATERS

Of the 297 water samples analysed, 144 were leachate samples from the lysimeters at Grasslands, and 86 were from the Chibuwe borehole in the Sabi Valley where a check is being maintained as this is the water supply for an irrigation experiment.

TOXICOLOGICAL SPECIMENS

The number of toxicological specimens analysed rose by 75 from the previous year's total to 594 samples. Testing for arsenic was required in most cases, and in 27 per cent. of all cases where arsenical poisoning was suspected, it was confirmed.

Sixty-five specimens were submitted in connexion with an investigation into the alleged occurrence of chronic arsenical poisoning in the Umtali North Intensive Conservation Area.

SOIL TESTING SECTION

As indicated by the figures shown in Table I, the use made by farmers and research stations has continued to expand steadily. The total number of samples received (6,237), which includes those not reported on yet, showed an increase of 15 per cent. which exceeds the rate of expansion reported last year.

The seasonal nature of the advisory aspects of the work, and the problems it creates, were more marked than usual this year. By the peak of the season (end of June), 50 per cent. more samples had been received than in the corresponding period of the previous year. This was probably due to the early and sharp cessation of the rains, which encouraged early sampling. As a result, a record backlog of 900 samples developed, which represents six weeks' maximum output of the laboratory. Fortunately, the influx of samples declined more sharply than usual in the latter part of the season, and by the end of September the backlog was largely eliminated. It is probable, however, that farmers were discouraged from submitting late samples because of the delay in analysis.

The number of advisory reports issued was 1,452, an increase of 8 per cent. on the previous year, and these involved the analysis of 4,386 soil samples. Reports were also issued on 1,385 samples submitted for compilation of scientific data or correlation with the results of critical field experiments.

The range of crops for which recommendations based on soil analysis were given, and the departments and institutions for which work was done, are shown in Table III. The advisory aspects of the work are further analysed in Table IV, to show geographical distribution and the principal crops for which advice was sought.

TABLE III

SOIL SAMPLES UPON WHICH REPORTS WERE ISSUED

	Southern Rhodesia	Northern Rhodesia	Foreign	Total
ADVISORY				
Tobacco: Flue-cured	1,105	310	3	1,418
Turkish	97	10	—	107
Other types	31	2	2	35
Seed-beds	21	—	—	21
Maize	914	215	7	1,136
Wheat	15	8	—	23
Potatoes	34	5	—	39
Other cash crops	119	24	—	143
Green-manure crops	17	6	—	23
Lucerne and fodder crops	87	35	—	122
Pastures	51	2	—	53
Market-garden crops	76	20	3	99
Fruit trees, vines, etc.	49	14	1	64
Sugar-cane	23	2	—	25
Tea and coffee	4	—	—	4
Other specialized crops	3	—	—	3
African farmers' crops	45	—	—	45
Southern Rhodesia Ministry of Agriculture	408	—	—	408
Conservation and Extension	46	7	—	53
Private gardens	115	5	2	122
Sports clubs	30	4	—	34
Diagnosis and fertility assessment	106	4	—	110
pH tests and liming rates	90	15	—	105
Miscellaneous analyses	1	—	—	1
Soil surveys for private estates	193	—	—	193
TOTAL	3,680	688	18	4,386
INVESTIGATORY *				
Chemistry	457	—	—	457
Research and Specialist Services	510	—	—	510
Conservation and Extension	32	18	—	50
Southern Rhodesia Ministry of Agriculture	252	—	—	252
Statutory Bodies	24	—	—	24
Other scientific organizations	92	—	—	92
TOTAL	1,367	18	—	1,385
GRAND TOTAL	5,047	706	18	5,771

* Includes only analyses for compilation of scientific data or for purposes of correlation with experimental data or field observations.

TABLE IV

ADVISORY SOIL SAMPLES REPORTED: COMPARATIVE DATA

This table shows, according to Territories and categories of work:

(a) The number of soil samples on which advisory reports were issued.
(b) This number as a percentage of the territorial total.
(c) This number as a percentage of the grand total from all sources.

	Year under review 1962-63			Previous year 1961-62		
Southern Rhodesia	*a*	*b*	*c*	*a*	*b*	*c*
Flue-cured tobacco	1,105	30%		1,191	38%	
Maize	914	25%		905	28%	
Other crops	672	18%		532	17%	
S.R. Ministry of Agriculture	408	11%		not recorded		
Miscellaneous *	581	16%		536	17%	
TOTAL	3,680		84%	3,164		81%
Northern Rhodesia						
Flue-cured tobacco	310	45%		352	50%	
Maize	215	31%		245	34%	
Other crops	128	19%		66	9%	
Miscellaneous *	35	5%		50	7%	
TOTAL	688		16%	713		18%
Nyasaland						
TOTAL	Nil			2		0.1%
Foreign						
Flue-cured tobacco	3	17%		32	64%	
Maize	7	39%		Nil		
Other crops	6	33%		16	32%	
Miscellaneous *	2	11%		2	4%	
TOTAL	18		0.4%	50		1%
Totals from all sources						
Flue-cured tobacco	1,418		32%	1,575		40%
Maize	1,136		26%	1,150		29%
Other crops	806		18%	614		16%
S.R. Ministry of Agriculture	408		9%	Not recorded		
Miscellaneous *	618		14%	590		15%
GRAND TOTAL	4,386			3,929		

* 'Miscellaneous' includes: private gardens and sports clubs; Conservation and Extension demonstrations, etc.; analyses for diagnostic purposes and liming recommendations only; soil surveys of private estates; analyses for non-agricultural purposes.

SOIL SURVEY SECTION

Soil Surveys

During the year the following surveys were carried out:

(1) An examination of the suitability for irrigation of the soils on part of the Sabi-Tanganda Estates and adjacent Crown land areas. Nearly all of the soils in this area were found to be suitable for irrigation.

(2) A reconnaissance survey of six irrigation projects of a relatively small scale in African areas in Matabeleland. One of the more promising schemes appears to be the Lukosi-Bongora project in which appreciable, though separated, blocks of mainly alluvial soils comprise a total of about 1,600 to 1,800 acres.

(3) A very brief reconnaissance of a block of land on part of the Nuanetsi Ranch near the Bubye River which the Southern Rhodesia Government had an option to purchase. Although there are a few large tracts in which a high proportion of soils suitable for irrigation could be expected, the laying-on of water is likely to prove expensive mainly due to distance from feasible, large-capacity dam sites.

(4) A reconnaissance survey covering about 180 to 200 square miles in the Ndanga East area (on the right bank of the lower Sabi River opposite Chisambanje) to assess the suitability of soils for irrigation. Although one large area of about 10,000 acres was found in which the soils are comparable to those at Chisambanje, the area is generally much more undulating and the proportion of very shallow soils is, therefore, much greater. The 10,000-acre block lies about five to six miles from the Sabi River.

(5) A very broad reconnaissance of certain lands that could be conveniently commanded by the Lundi-Tende and Nuanetsi-Manyoshi dam sites.

(6) A very detailed survey covering about 8,000 acres on Triangle Sugar Estates. Within this area the company plans to open up about 6,000 acres of new land which will be planted to sugar-cane under irrigation.

(7) A semi-detailed survey on parts of Chirundu Sugar Estates in connexion with the development of a further 500 acres of land under irrigated sugar-cane.

(8) A number of minor investigations, including a semi-detailed survey of an extension (involving seven farms) to the proposed Wengi irrigation scheme in the Mazoe Valley, and a detailed survey of about 70 acres comprising a yellow-maize experimental block and a fibre research block, on the Henderson Research Station. A systematic soil survey of the station is planned for 1964.

(9) A reconnaissance of the Chiredzi area, which is still proceeding.

Laboratory Work

A total of 194 soil samples were analysed during the year, the majority being for pedological investigation of representative soil types occurring in Southern Rhodesia. The total number of samples analysed by the Section was smaller than in the previous year, since much of the analytical work on samples taken during the course of the 1961/62 Triangle Sugar Estates survey was carried out by the Soil Testing Section.

Special Investigations and Activities

In regard to pedological classification and mapping, sufficient data, both analytical and mineralogical, have now been accumulated to enable the Senior Officer to classify and to describe the soils of Southern Rhodesia on a pedological basis and to prepare a new soil map at a scale of 1:1,000,000.

To carry out this undertaking, however, some time will have to be set aside specifically for this purpose since, as a result of shortage of trained soil survey personnel, the pressure of routine soil survey commitments precludes any sustained concentration on this task.

PUBLICATIONS

1. Barnes, D. L. and Hava, K.—'The effect of cutting on seasonal changes in the roots of Sabi Panicum (*Panicum maximum Jacq.*).' *The Rhod. Jour. of Agr. Res.*, 1, 107-110, 1963.

2. Cackett, K.E. and Metelerkamp, H. R. R.—'The relationship between evapotranspiration and the development of the field bean crop.' *The Rhod. Jour. of Agr. Res.*, 1, 18-21, 1963.
3. Chemistry Branch.—'General fertilizer recommendations.' Handbook, Dept. of Conservation and Extension, Federal Ministry of Agriculture, Rhodesia and Nyasaland.
4. Fenner, R. J.—'Risk of tobacco soil becoming too acid.' *Tobacco Forum of Rhodesia and Nyasaland*, 7, 7-8, February 1963.
5. Grant, P. M.—'Trace element deficiencies in Kalahari Sands.' *Rhod. Agr. Jour.*, 59, 310-311, 1962.
6. Grant, P.M.—'Some factors affecting the growth of soya beans.' *The Rhod. Jour. of Agr. Res.*, 1, 12-27, 1963.
7. Jaklitsch, L. and Rhodes, F. B.—'Observations on Star Grass control in lucerne with Dalapon.' *Rhod. Agr. Jour.*, 60, 67-69, 1963.
8. Saunder, D. H.—'The use of fertilizers in Rhodesia.' Handbook, Dept. of Conservation and Extension, Federal Ministry of Agriculture, Rhodesia and Nyasaland.
9. Soane, B. D.—'The importance of soil characteristics in the hydrological environment of plants.' Proceedings of the Sixth Annual Conference of Professional Officers of the Department of Research and Specialist Services, Federal Ministry of Agriculture, Rhodesia and Nyasaland, 1963.
10. Thompson, J. G.—'Climate and soils in Southern Rhodesia.' Proceedings of the Sixth Annual Conference of Professional Officers of the Department of Research and Specialist Services, Fed. Ministry of Agriculture, Rhodesia and Nyasaland, 1963.
11. Thompson, J. W.—'Effects of fertilizers and soil amendments on the mineral constituents of maize.' *Soil Science*, 94, 323-330, 1962.
12. Weinmann, H.—'Action and economics of fertilizers.' *The Windmill*, 4, p.4, 1963.
13. Weinmann, H.—'Nutrient requirements of wheat. Irrigated winter wheat.' Technical Publication No. 1, Part III. *Rhod. Agr. Jour.*, July-August 1963.
14. Weinmann, H.—'The response of grasses to fertilizers in Southern Rhodesia.' A review (to be published as Technical Publication to *Rhod. Agr. Jour.)*

ENTOMOLOGY

INTRODUCTION

The staff situation was, on the whole, satisfactory throughout the year, there being only one resignation, that of Mr. J. A. Farrell, the Stored Products Entomologist, seconded to the Grain Marketing Board. This post has remained vacant since 31st May. Once more the main emphasis in research has remained on the underground pests of maize. Besides general duties, as they have gained in experience, the newly recruited entomologists have taken special subjects to themselves, Mr. Hodgson the study of scale insects and Miss Richardson that of potato tuber moth, with special emphasis on insecticide resistance. Mr. Rose and Mr. Hodgson have done the main work on underground maize pests in Southern Rhodesia, complementary to that of Mr. Wilson in Northern Rhodesia. Mr. Carnegie has continued to work on the pests of deciduous fruits and vegetables in the Eastern Districts and Mr. Whellan has remained responsible for phytosanitary matters and work on the biological control of *Lantana* and *Salvinia*. Mr. Martin has worked on nematology.

Mr. Whellan presided at the Fifteenth Session of the International Red Locust Control Service which was held at Luanda, Angola, in June. He also took the chair at a meeting of the Executive Committee of the Service held in Salisbury in February. He took the chair at the eighth meeting of the Inter-African Phytosanitary Commission held in London in October, and at an interim meeting of the Advisory Committee of the Inter-African Phytosanitary Commission, also held in London in July. He attended, as representative of the Inter-African Phytosanitary Commission, the first meeting of regional phytosanitary organizations held under the auspices of FAO in Rome in October. Mr. Rose attended the FAO Symposium on the use of radiation and radioisotopes for insect control which was held at Athens in April, and Mr. Carnegie attended the annual meeting of the

East African Specialist Committee on Entomology held in Mombasa in September, where special attention was given to the pests of coffee. While abroad, both these officers took the opportunity to visit research stations. The Chief Entomologist, or his deputy, attended meetings of the Rhodesian Nurserymen's Association, the Rhodesian Cotton Growers' Association, the National Publications Trust, the Salvinia Sub-Committee of the Kariba Lake Co-ordinating Committee, the Tobacco Science Congress and the Tobacco Trade Congress, special meetings concerned with the control of tobacco veinal necrosis, the RNFU Congress and the departmental conference as well as numerous farmers' meetings, field-days and similar functions. A very successful course of instruction was given to nurserymen. A large part was played by officers of the branch in giving instruction in the course to Pest and Weed Control Officers, arranged by the Department of Conservation and Extension. The opportunity was taken of bringing together the Plant Inspectors for the parts of this course appropriate to their work. Instruction on red locust recognition and reporting was given to the congress of Group Conservation Officers.

INVESTIGATION AND RESEARCH

PINK BOLLWORM *(Platyedra gossypiella)*

The incidence of pink bollworm has remained low. It has been found on the Sabi Experimental Station but not on any of the African cotton-growing areas in the Sabi Valley. Generally, control of the alternative host plant, *Hibiscus dongolensis,* has been good. Three old specimens of pink bollworm were discovered during an examination of the collection made by D. A. Allan in Northern Rhodesia. Unfortunately, they lacked data labels. This Branch is not aware of any definite record of this insect in Northern Rhodesia. It was found recently in some quantity in a locality in Nyasaland.

FRUIT INSECTS

(a) Fruit-flies and Melon flies:

Insecticide trials against melon-flies and fruit-flies (Fam. *Trypetidae)* using two systemic insecticides showed that fenthion ('Lebaycid') was somewhat more effective than dimethoate ('Rogor'),, but that both gave good control. The insects concerned were:

Pterandrus rosa (Ksh.) on peaches and

Dacus ciliatus Lw. and *D. bivittatus* Big on gem squashes.

Emulsifiable concentrates of both insecticides were used, and these were diluted in water so that the fenthion contained 0.069 per cent. active ingredient and the dimethoate 0.055 per cent. They were applied as foliar sprays using a knapsack sprayer.

In all three trials, the percentage of fruit which contained living maggots was always much lower for the treated plots. In the case of unsprayed peaches, stinging, with subsequent maggot development was almost always followed by the collapse of the fruit, but when sprayed peaches were cut open, although signs of stinging and vacated egg cases could often be seen, the young maggots had apparently died, and the fruits had recovered.

(b) Woolly Aphis (Eriosoma lanigerum)

Following last year's trials in which insecticide concentrates were injected into tree trunks, further trials were carried out in which the systemic insecticide dimethoate was applied in four different ways: these were by injection in 20 places into the soil surrounding trees near the bases of stems, using a nematicide gun; by irrigation around trees with diluted insecticide; by banding the lower stem with cloth and cotton wool soaked in a 3 : 1 dilution of insecticide, and protected on the outside with polythene to prevent evaporation; and by painting concentrated insecticide on the lower stem.

In each case dimethoate was used, and eight applications were made at two-week intervals.

In no case was there any evidence of control being achieved, and the trials were discontinued.

For nearly a year four trees have been sprayed at approximately three-week intervals with DDT at normal strength to investigate its effects on the parasite *Aphelinus mali*. So far no appreciable effect has been noted.

(c) Fruit-piercing Moths:

Little progress has been made in achieving control of these insects. Comparative tests made in the laboratory have shown that sevin and dimethoate show more promise than malathion and that derris is ineffective.

Maize Pests

(a) *Maize Streak:*

Further field trials were made at Bulawayo and Chipinga comparing insecticidal treatments for control of streak virus in irrigated maize. The trial carried out at the Umgusa Irrigation Plot near Bulawayo was severely attacked by streak infection. A significant reduction in the level of infection was obtained when 5 per cent. disyston or 10 per cent. thimet granular was applied into planting holes at the rate of 2 lb. of active ingredient per acre. In each case the level of infection was 24 per cent. compared with 39 per cent. in unprotected plots. The additional sprays with metasystox at ten-day intervals gave little further benefit. Yields were increased from 8.45 bags (no treatment) to 11.05 bags per acre (5 per cent. disyston in planting holes plus five sprays with metasystox). The Chipinga trial was abortive because of the low level of streak infection there.

Three vector species, *Cicadulina mbila* var. nov., *C. storeyi* and *C. parazeae* were widely collected and information on sex ratios and host plants obtained. With all species, females preponderate in the field and it was found that the sex ratio is much higher on cereal crops such as maize (323 ♀ : 47 ♂) and wheat (418 ♀ : 97 ♂) than on grasses (328 ♀ : 119 ♂).

(b) *Maize Snout beetle (Systates exaptus):*

The life-cycle of the maize snout beetle has been investigated and is now known in broad outline. The grubs remain dormant from April to November in cells inside clods of soil in infested fields. At the beginning of the wet season the grubs become active and feed on the surface of underground parts of germinating maize seedlings. The grubs pupate during December and emerge about a week later as beetles. The beetles feed on the leaves of maize plants. There is some delay before beetles are mature, and eggs are then laid in loose batches on the plant under small folds made in the leaves. Eggs hatch in about five days and the newly hatched grubs live in the soil and feed on the roots of plants. Good survival of the young grubs may be dependent on plentiful weed growth in the maize lands at this time. The grubs continue feeding until the end of the wet season when most grubs are found beneath maize plants.

It has been found that this pest is most numerous after continuous maize, soya beans, sunnhemp and, sometimes, groundnuts. Continuous maize production seems to be the most frequent cause of high populations of snout beetle on farm lands. This is to be expected in view of this pest's life-cycle. As the beetle is unable to fly there is a tendency for lands to be reinfested year after year if farming practices are favourable. The beetles feed on soya beans and sunnhemp but exactly why heavy infestations develop in them is not fully understood.

A soil sampling technique has been developed for recovery of snout beetle grubs from soils during the dry season. This technique has been recommended to farmers so that they can avoid planting in infested untreated lands.

During the course of soil sampling, as well as *Systates exaptus*, three other different kinds of weevil grubs were found. One of these has been identified as *Mesoleurus dentipes* Mshl. but the other grubs have not yet been reared to the adult stage. Fields which have been in continuous maize production harbour large numbers, one species generally predominating.

Field trials were carried out at Gwebi Agricultural College to appraise the use of various insecticides for the control of these weevil grubs. Dieldrin, aldrin, telodrin and heptachlor dusts were broadcast and disced into the soil before planting at the rate of 1 lb. of active ingredient per acre; and sprays were applied in a band into the soil at time of planting at the rate of $\frac{1}{2}$ lb. of active ingredient per acre. Heptachlor sprays were compared using two concentrations of $\frac{1}{2}$ lb. of active ingredient per acre in six and 20 gallons water. Results were assessed by rating damage to seedlings, plant stand counts and yield. Band applications of the heptachlor spray, at either volume used, gave the best protection. Dust applications were ineffective except for telodrin for which the results were conflicting. Dieldrin and aldrin gave little, if any, protection to seedlings.

Laboratory tests were subsequently made to screen a wider range of insecticides for future field investigation. The criterion used was length of time in contact with the insecticide before 50 per cent. of the grubs were—

(i) unable to walk; or

(ii) showed no movement under the microscope when prodded.

From the results BHC, diazinon, malathion and sevin showed most promise, followed by parathion, then heptachlor, DDT, dieldrin in that order, the last being little, if any, better than the control. These results confirm the poor control obtained with dieldrin in the field and they also indicate that it may be possible to find a better insecticide than heptachlor. Recent germination tests and pot trials have ruled out the use of BHC on grounds of phytotoxicity but diazinon appears to be most promising.

(c) Maize Rootworm (Buphonella murina):

Field trials against maize rootworm were carried out this year and tested the application of four insecticides as sprays on the seed before covering, and on the soil surface above the seed after covering the seed with soil. Seed-dressing trials were repeated. The insecticides used in sprays were aldrin wettable powder, dieldrin, telodrin and heptachlor emulsifiable concentrates all at the rate of ½ lb. of active ingredient per acre. The same insecticides were used as seed dressings at the rate of 1 oz. of wettable powder per 5 lb. of seed.

Because of a very wet season the incidence of maize rootworm was low (11 per cent.) in the plots compared with previous years (30 per cent.).

A statistical analysis of the results obtained was made by the ARC Biometrics team and showed that the application of insecticide as a seed dressing or as a spray on the seed significantly reduces losses due to rootworm; but not when the spray is applied to the soil surface. The analysis was unable to discriminate between the insecticides used. The trial plots were left standing until attack by termites became noticeable. The maize was cut and stooked plot by plot and the plants attacked by termites recorded. The number of plants attacked by termites in the control plots averaged 40 per cent., whilst in the treated plots 10 per cent. were attacked in the seed-dressing plots, 4 per cent. in the plots where the insecticide was sprayed on the soil surface and only 1 per cent. on the plots where the insecticide was sprayed on the seed.

The maize was harvested and weighed several weeks later and yield increases of as much as seven bags of grain per acre were recorded. This conclusively illustrates the value of insecticides applied to the soil at planting time in areas susceptible to attack by soil pests.

Field scale trials designed to test lower rates of application of the insecticides aldrin, telodrin and heptachlor in insecticide-fertilizer mixtures were inconclusive due to the low level of rootworm attack, but indicate that as little as two ounces of active ingredient of these insecticides per acre applied in this way is likely to give effective control. No appreciable phytotoxic effects were observed in any of these trials.

SAN JOSE SCALE *(Quadraspidiotus perniciosus)*

Since last year the apparent distribution of this pest has increased considerably —this is probably due to more people becoming aware of its existence than a true indication of spread. It is now known to be fairly frequent throughout the Eastern Districts from Juliasdale to Melsetter. It has been reported from no further Salisbury suburbs, but has recently been found in an orchard at Gwelo. There have been no reports of its occurrence in Northern Rhodesia which is likely to be because of the much smaller quantity of deciduous fruit grown. So far only deciduous fruit trees, apples, plums, pears, peaches and almonds have been recorded as hosts in Southern Rhodesia.

Small-scale insecticidal spray trials were carried out at Melsetter in March. The treatments used were dimethoate alone, methyl-demeton alone, dimethoate and methyl-demeton together and diazinon alone. These were all used at manufacturers' rcommended strengths. Two trees were used for each treatment, and there were two control trees. Samples were taken from each tree and the percentage of dead and living scales estimated before and after treatment. In each case about 100 scales were examined. The results showed some decrease in numbers with all treatments, but the differences were not significant, and everything considered, dimethoate alone was probably the most successful treatment.

COTTON PESTS

Considerable attention was devoted to a survey of pests of cotton in Northern Rhodesia. Red bollworm was found to be generally absent but was found in isolated places: Fort Jameson area, Gwembe Valley and Livingstone area. American bollworm was the most devastating pest of cotton last year, especially towards the end of the season when spray programmes tailed off. Spiny bollworm was rather less important than American but, with the predominance of DDT sprays, did tend to build up towards the end of the season and was found boring into green bolls quite frequently. Aphis was widespread on young plants very early and sprays of dimethoate were used very early in the season. Towards the end of the season stainers became rather abundant and stained cotton was very obvious in some fields. Jassid was a very important pest where spraying was not practised.

LOCUSTS

In the recognized outbreak areas of the red locust, populations were generally low. This was probably due to a combination of the effects of the control measures applied by the International Red Locust Control Service and the continued flooding due to a succession of very wet seasons. Two new areas, both within the Federation, were however recognized as outbreak areas. These were part of the Kafue Flats in Northern Rhodesia and an area adjoining Lake Chilwa in Nyasaland. Some alarm was caused in both of these areas. The Kafue area adjoins settled farms and some local damage was caused to maize. Though localized spraying with dieldrin was carried out against the major hopper concentrations, these were generally not considered sufficiently dangerous to justify further aerial spraying. The Lake Chilwa swarms were, however, sprayed from the air by planes of the IRLCS, sevin being used because of the presence of many people and cattle in this area. These areas now under regular surveillance by the IRLCS, but do not seem to pose any threat, other than locally, at present.

During his visit to Angola the Chief Entomologist found the southern form of the desert locust, *Schistocerca gregaria flaviventris* in considerable numbers in the Namib Desert inland of Moçamedes. Though not surprising, since it has been known for many years in neighbouring South West Africa, this seems to be the first record of its occurrence in Angola.

CADDIS FLIES

The caddis fly trouble reported last year as due to incrustation of irrigation canal walls with the larvae of *Amphipsyche senegalensis* has been resolved. In the first instance clearing of the canal walls abated the nuisance but when the infestation began to increase again the water was treated with DDT. In doing this the flow was reduced and DDT wettable powder at the rate of 1 lb. active ingredient per 100,000 gallons was applied continuously for eight hours. This was completely effective. No further infestations occurred, but in October a similar trouble cropped up due to the presence of numerous pupae of *Simulium* sp. on the walls. These were present only in the top three inches of water but occurred along the whole length of the canal. The water-level was lowered and the DDT treatment repeated and one or both of these factors eradicated the *Simulium*. When examined in March by entomologists there had been no recurrence of the trouble, nor has any been reported since.

BIOLOGICAL CONTROL OF NOXIOUS WEEDS

(a) *Lantana camara:*

The work on *Lantana camara* has so far been very disappointing. All localities of release of *Teleonemia scrupulosa* have been re-examined and it was not detected in any of them. The stock on the experimental plants at Salisbury, though still substantial, has declined so that further releases have not been possible. No spread from the experimental plants has been observed. During leave taken near Mombasa, it was observed that, despite the abundance of this insect noted previously to the south of Mombasa, to the north *L. camara* was very abundant and thriving. It is clear that the establishment of several insect enemies of this plant will be necessary if good results are to be achieved. Unfortunately, our counterparts in Natal and Uganda are running into difficulties and no further species have yet been introduced. While in London the opportunity was taken to discuss the taxonomy of *Hypena strigatus* and *Ophiomyia lantanae*, the other two suggested controlling species which already occur here, with the specialists at the British Museum.

(b) *Salvinia auriculata*

Two surveys, one in mid-summer, one in spring, of the insects associated with *S. auriculata* at Lake Kariba were made. Both surveys showed a remarkable paucity of insect life and no evidence was found to suggest that there are, at present, any insects at Kariba which have any appreciable effect on *Salvinia*. Indeed, the lack of damaged fronds was most striking. Concurrently, observations have meen made in South America, the original home of the plant, under the aegis of the Commonwealth Institute of Biological Control and these have revealed the existence of several insects which appear promising for biological control. It is hoped to introduce one or more of these species as soon as possible. This will depend on feeding tests and the ease or otherwise of breeding the insects in numbers.

HELMINTHOLOGY

Soil fumigation trials, in the sand veld areas at Chirundu Sugar Estates, have resulted in tremendous increases in the growth of sugar-cane which, due to attacks by plant parasitic nematodes (chiefly *Meloidogyne javanica*), had been exhibiting poor growth and in many cases, severe stunting. The use of ethylene dibromide soil fumigant has given excellent control of root-knot *(Meloidogyne* spp.) and other plant parasitic nematodes but has also brought about a considerable increase in the soil population of the stubby root nematode *(Trichodorus* sp.). It is thought that in view of this, the use of a residual nematicide will be found to be necessary. Long-term experiments have been initiated, in an attempt to ascertain the most economic and effective soil fumigant and method of application. The estate has already embarked on a programme of large-scale soil fumigation which will be modified in the light of experiments and the results expected for the experimental work.

With a view to filtering out plant parasitic nematodes and *Schistosoma* cercariae from river water, tests were carried out with the 'Thomas Tube Filter' which uses diatomaceous earth as the filtering medium. The tests were on a practical scale, involving the use of 4,000 gallons of water and 500,000 nematodes. The results indicate that such a filter, as designed at present, can greatly reduce, but not prevent, the passage of nematodes.

In the *Meloidogyne javanica* longevity experiment, light infections of *M. javanica* resulted when tomato plants were grown in soil after a period of 4½ years bare fallow. The nematodes showed a greater survival rate in sand veld than in red and black clayey vlei soils. This experiment is now completed since no more samples are available for its further extension.

Examinations of soil around citrus trees growing in Matabeleland and the Midlands show that, as in Mashonaland, the citrus nematode *Tylenchulus semipenetrans*, is widespread. Composite soil samples, on a grove basis, from 12 groves, involving sampling from thousands of trees, revealed that there were many more nematodes, both plant parasitic and non-parasitic, in the soils of groves of high-yielding trees than in those of low-yielding trees. The reasons for this are not known.

Basin application trials, in which nemagon (1, 2, dibromo-3-chloropropane), a slow-acting but residual nematicide, was used at various dosage rates on apple, peach and pear trees at Inyanga, coffee seedlings at the Vumba and grapefruit trees at Shamva. No apparent phytotoxic effects have resulted at any of the dosage levels employed. Excellent control (99.9 per cent.) of the citrus nematode, to a known depth of 3 ft., was achieved at Shamva and even 12 months after treatment there was an 80 per cent. reduction of nematodes in the treated soil. The results achieved at Inyanga and the Vumba were, however, not nearly as good, only some 50 per cent. control of plant parasitic nematodes being achieved. The differences in the degrees of control achieved might well be climatic.

ADVISORY SERVICE

A total of 521 inquiries was recorded at the Salisbury office, 202 at Umtali and 129 at Mount Makulu. A particularly interesting one concerned the scale insect *Margarodes* sp. which was found in vast numbers attacking sugar-cane and causing serious damage at Triangle and Hippo Valley. An attempt to control it by soil fumigation with DD failed and so far no satisfactory control measures have been evolved. Though well known on lawns and other grasses the Branch has not traced any record of damage to sugar-cane by this insect elsewhere. Another lawn scale *Antonina natalensis* Nietn., previously hardly known here, has been recorded several times in both Northern and Southern Rhodesia this season. It is a serious pest of golf courses and bowling greens in South Africa. A black fly was found on citrus in Northern Rhodesia. This proved not to be the well-known pest *Aleuracanthus woglumi*, which does not occur in the Federation, but a related species *A. hansfordi* Corb. The larva of a moth *Mussidia nigrivenella* caused damage by boring into *Khaya nyassica* and also the related species *Cedrela toona* in Nyasaland. There was no outbreak of army worm, though many reports of its occurrence were received. Whenever these could be investigated they proved to refer to the related lawn caterpillar, *Spodoptera capicola*. In the Northern Province of Northern Rhodesia the most destructive pest of coffee appears to be *Antestiopsis lineaticollis*, and the white borer. *Anthores leuconotus* is also abundant. A mealy bug causing berry drop was recorded from Solwezi but, because only immature forms were present, identification was not possible. A larva very similar to red bollworm was found in bolls of *Hibiscus dongolensis* in the Sabi Valley. Attempts to breed it failed so that its identity remains unknown. The beetle *Melyris waldecki*, which commonly attacks citrus flowers, was reported doing extensive damage to *Eucalyptus* flowers in Northern Rhodesia. Other unusual records of minor importance were of an aphid, *Saltusaphis scirpus* Theo., found in large numbers on water grass, the olive bug, *Teleonemia australis*, at Mazoe, the larvae of a moth, *Tortrix occidentalis*, damaging coffee at Chipinga, membracid bugs, *Oxyrhachis rufula* and *O. delalandei*, occurring in large numbers on *Cassia coluteoides* and aubergine respectively, the spiny bush-cricket, *Acanthoplus speiseri*, in large numbers damaging bulrush millet in Northern Rhodesia and a related species, *Enyaliopsis petersi*, causing dermatitis due to the acrid fluid which it ejects.

PHYTOSANITARY SERVICE

LEGISLATION

An amendment to the Plant Pests and Diseases (Importation) Regulations was made as Federal Government Notice 217/63. This made the importation of lettuce seed subject to permit with the object of controlling the spread of lettuce mosaic disease.

The Plant Pests and Diseases (Nursery) Regulations were amended by Federal Government Notice 364/62 with the objects of increasing the fee for nursery registration and, provided proper safeguards are taken, reducing the quarantine period where a nursery had been declared an infested area.

Regulations with the title Plant Pests and Diseases (Potato and Tobacco Growing) Regulations, 1963 were published as Federal Government Notice 199/63. Their object is to restrict the spread of necrotic virus Y disease by separating, as far as practicable, the growing of potatoes and tobacco.

QUARANTINE

The plant quarantine house was again used largely by the Forestry Commission for raising grafted pine material.

IMPORTS

A consignment of pears infested with codlin moth was intercepted at Bulawayo. Imported apples at Lusaka were found to be lightly infested with this insect. Several consignments of apples infested with mites were fumigated and subsequently released.

A consignment of Satsuma plums with a 2.4 per cent. infestation of Mediterranean fruit-fly was intercepted.

Importations of 17,590 consignments involving 1,217,035 packages of plant materials were supervised at the main points of entry into Southern Rhodesia, at which Plant Inspectors operate namely, Bulawayo, Gwelo, Salisbury and Umtali, the figures again showing a slight decrease on last year's.

Permits for the import of plants issued during the year totalled 669. Inspections of large quantities of citrus fruit for export by Hippo Valley were carried out partly by officers of the Branch and partly by the local Conservation Officers. The total of phytosanitary certificates issued was 873. In order to facilitate the transit of produce and seed for export through Beira, an arrangement was made with the Portuguese authorities whereby a simplified certificate issued by the exporter was acceptable.

The vacuum fumigation plant for export tobacco was installed at Beira and put into operation early in the year. It was examined by the Chief Entomologist later on, by which time it was functioning to capacity, as it has very largely done since.

NURSERIES

The number of nurseries registered in Northern and Southern Rhodesia showed a drop to 61. Several smaller ones closed down due to poor business. The increased registration fee is designed to help cover the expenses of more frequent inspections with a view to keeping closer control on nurseries and reducing the danger of any spread of pests. All nurseries, except for a few remotely situated ones, were inspected twice during the year. The level of cleanliness was generally good and in the few cases where quarantine restrictions were imposed these were short-lived due to the prompt action which was taken in applying remedial measures.

PUBLICATIONS

Carnegie, A. J. M.—'Woolly aphid of apple, *Eriosoma lanigerum* (Hsm) and its control in Southern Rhodesia.' Bull. ent. Res., 53, pp. 609-619, 1963. 9 pp., 2 figs., 3 tabs.

Goldsmid, J. M.—'The mites (Acarina) of the Federation of Rhodesia and Nyasaland.' *Rhod. Agric. J.*, 60, 1963. (Supplement issued as Bulletin 2162 of the Federal Ministry of Agriculture.)

Hodgson, C. J. and Rose, D. J. W.—'Check your lands now for maize snout beetle grubs.' *Rhodesian Farmer*, 34, 1963, pp. 20, 22.

Rose, D. J. W.—'Pests of maize and other cereal crops in the Rhodesias.' *Rhod. Agric. J.*, 60, 1963. (Supplement issued as Bulletin 2163 of the Federal Ministry of Agriculture.)

Rose, D. J. W.—'Pests of wheat.' *Rhod. Agric. J.*, 60, 1963. (Supplement issued as Technical Publication No. 1 of the Federal Ministry of Agriculture; pp. 18-20 of T.B.)

Wilson, K. J.—'Life history and control of maize rootworm—*Buphonella murina* Gerst.' *Rhod. Agric. J.*, 60, pp. 1-44, 1963. (Supplement issued as Bulletin No. 2169 of the Federal Ministry of Agriculture.

Wilson, K. J.—'Underground pests of maize in Northern Rhodesia.' *Rhod. Agric. J.*, 60, pp. 111-114, 1963.

In addition, three duplicated pamphlets were produced as Farmers' and Agricultural Officers' bulletins by the Northern Rhodesia Department of Agriculture, all prepared by K. J. Wilson. These were: 'Semi looper caterpillars in Northern Rhodesia', 'Red locust in Northern Rhodesia', and 'American bollworm in Northern Rhodesia'.

Several officers of the branch contributed appropriate portions to the Handbook for Conservation and Extension Officers.

HORTICULTURE

The interest in horticultural crops as alternatives to field crops has been maintained and requests for horticultural services continue to increase. The recruiting of a Chief Horticulturist and an additional Advisory Horticulturist during the year has made it possible to improve services.

CLIMATE

A very hot, dry spring was followed by a season of heavy and continuous rain and then an early winter with many severe frosts.

These conditions were generally unfavourable; citrus crops were reduced by fruit drop although the early cold weather improved their colouring; avocados and mangos suffered from fruit drop and splitting; vegetable production was completely upset by the heavy rains and both tomato and pea crops were severely damaged by frosts.

FRUIT CROPS

DECIDUOUS

Planting deciduous fruit continues to increase although shortage of nursery trees from South Africa caused some reduction in plans.

The apple and dessert peach crops were good, but plums and cling peach crops were poor. More grape vines were planted and some commercial wine was made, but the heavy rains adversely affected the fruit. Presentation and marketing of deciduous fruit generally continues to improve.

The statistical returns for Southern Rhodesian deciduous fruit in 1962 show that apple, plum and grape plantings have increased while peach and pear have decreased.

	Number of Trees (Southern Rhodesia)	
	1962	*1961*
Apples	83,000	71,000
Peaches	56,000	91,000
Plums	24,000	22,000
Pears	5,000	9,000
Apricots	3,000	3,000
Grapes	74,000	66,000

The quantity and value of imports into the Federation of deciduous fruit in 1962 indicates an increased consumption and scope for expansion.

FRESH FRUIT IMPORTATIONS (FEDERAL)

	1962		*1961*	
	Tons (*2,000 lb.*)	*Value* £	*Tons* (*2,000 lb.*)	*Value* £
Apples	3,235	201,325	2,758	170,055
Plums	226	13,873	234	14,198
Grapes	1,668	89,218	1,485	77,415
Other deciduous . .	1,571	94,939	1,421	88,013

CITRUS

The season was about three weeks early and crops were good. Full import control of citrus from Moçambique was imposed from June, resulting in the locally grown supplies, particularly of naartjies, being taken up in full.

The export of grapefruits, lemons and Valencia late oranges from Hippo Valley Estates increased considerably during the year.

The following statistical returns show the expansion that continues to take place in citrus.

		Number of trees		*Value of fruit*	
		1962	*1961*	*1962* £	*1961* £
Southern Rhodesia	—Oranges . .	452,000	424,000	209,100	229,000
	Other citrus .	156,000	105,000	57,100	24,000
Northern Rhodesia	—Oranges . .	75,000	74,000	35,200	35,200
	Other citrus .	90,000	34,000	9,000	8,800

Imports of fresh citrus fruit into the Federation in 1962 amounted to 1,025 tons valued at £15,702.

SUB-TROPICAL FRUITS

There is considerable scope for increased production of bananas, mangoes, papaws, avocados, litchies and pineapples, both for the internal market and, for limited quantities of high-quality fruit, for the export market.

With the development of lowveld areas these crops are likely to receive more attention.

Several consignments of avocados from Melsetter were successfully exported to Covent Garden.

Following the introduction of import control of bananas from Moçambique in April a special investigation was made of production methods in the Burma Valley with the object of increasing production.

Imports into the Federation in 1961 and 1962 were as follows:—

	1962		*1963*	
	Tons (*2,000 lb.*)	*Value* £	*Tons* (*2,000 lb.*)	*Value* £
Bananas	5,602	67,109	5,523	68,782
Other subtropicals	618	24,365	542	21,594
Other fruit (melons, etc.) . . .	408	15,562	573	15,553

VEGETABLES

The acreage under both summer and winter vegetables decreased considerably, yet supplies were generally adequate except during the rains, when cropping was more difficult than for many years.

Standards of production and packaging continue to improve.

ONIONS

Although acreages decreased, the good weather condition for ripening, harvest and storage contributed to much higher yields.

The 'Cape Flat' variety is still extensively grown for storage but the hybrid 'Dessex' which has proved high yielding and early, will help considerably in the drive for self-sufficiency.

MUSHROOMS

To encourage local production of fresh mushrooms an import duty of 1s. per lb. was imposed during the year.

The export of dehydrated and canned vegetables increased substantially while the importation of fresh vegetables showed little change.

	1962		*1963*	
	Tons (2,000 lb.)	*Value £*	*Tons (2,000 lb.)*	*Value £*
(*a*) *Exports*				
Dehydrated vegetables	307	236,240	137	110,477
Other processed vegetables	125	12,052	79	7,077
(*b*) *Imports*				
Fresh vegetables	862	38,927	943	31,216
Onions and garlic	2,764	104,974	2,422	88,774
Beans, preserved	548	50,722	714	65,775
Peas, preserved	155	13,451		
Frozen vegetables	145	23,000	142	28,883
Other preserved vegetables	994	138,872	1,203	163,905

SPECIAL CROPS

COFFEE

A specialist in coffee production started work in January and is employed on a three-year contract to assess the potential for the crop and to provide planters with specialist advice. There are at present 542 acres under coffee in Southern Rhodesia and 30 in Northern Rhodesia, but this is likely to be doubled in the near future.

Since only quality coffee commands a high price on the world market, emphasis is being placed on improving processing and assessing the quality potential of different ecological areas.

TEA

The acreage under tea, confined to the higher rainfall areas of the Eastern Highlands, continues to increase and although a low proportion is, as yet, unproductive, the weight picked and the yield per acre was higher than in 1961.

	1962	*1961*
Acres, total	5,640	3,890
Acres, productive	3,320	3,020
Yield, lb.	2,839,800	2,379,000

ESSENTIAL OILS

Considerable interest is being shown in the possibilities of growing rose-scented geraniums for essential oil and a number of farm trial plots have been established. One company hopes to export commercial quantities within the next year.

ORNAMENTAL CROPS

There were 65 registered nurseries in Southern Rhodesia and 16 in Northern Rhodesia, but trading was still depressed.

The value of imports into the Federation during the year was as follows:

	£
Trees and shrubs	16,740
Plants	4,999
Bulbs and tubers	12,059
Cut flowers	13,657

Chrysanthemum growing for the production of flowers all the year round, using artificial light, has proved successful near Salisbury and is to be extended.

Gladioli growing for the production of corms and cut flowers is receiving attention, the latter as a potential export by air to Europe.

PESTS AND DISEASES

There were no serious outbreaks of pests but tuber moth damage, resulting from inadequate control measures, reduced the market prices of potatoes.

Fruit-piercing moth damaged peaches and apples but Lebacid gave good control of fruit-fly in deciduous fruit and its use has been extended considerably.

Summer tomato crops were seriously affected by both early and late blight except where thorough spraying with zinab and maneb was done.

Black rot disease *(Xanthomonas)* of cabbage crops became serious during the rains.

RESEARCH AND INVESTIGATIONAL WORK

The Horticulture Branch has overall responsibility for research work on deciduous and soft fruits at the Rhodes Inyanga Orchards and for the work done at Henderson Research Station on vegetables but these are reported separately by the Research Stations.

Some trials were carried out in Umtali on onions, peas, broadbeans, carrots and sprouting broccoli, while at the Eastern Highlands Research Station, Melsetter, observational work continued on deciduous and soft fruits and vegetables.

On the Government Farm, Chipinga, some trials on coffee have been started to assess the effects of mulch and nitrogen.

Five varieties of pyrethrum were imported as seedlings and planted for observation and multiplication.

MARKETING

Good quality deciduous fruits were in strong demand, particularly apples, towards the end of the season.

Citrus fruits were less easy to sell during the prolonged cold period and prices were generally lower than in the previous year.

Vegetables were difficult to sell except during the rains and the hot summer also reduced the demand for onions.

The increasing tendency to pay cash allowances in place of a vegetable ration is probably an additional factor responsible for reduced vegetable sales.

The prospects of exporting a number of horticultural products by air to London and European markets have been investigated and preparations made to introduce regulations controlling the quality standards of such exports.

PROCESSING

The Umtali factory increased its output of dehydrated, canned and deep-freeze products in spite of the heavy rains which reduced contract crops in summer, and the frost which damaged pea crops in winter.

In the Enterprise area there was a marked increase in the production of frozen vegetables, particularly peas, carrots and grapefruit segments.

STAFF AND SERVICES

Following extensive study tours in South Africa, Israel and Kenya, the Chief Horticulturist assumed duty in March.

The Senior Horticulturist spent 11 days studying sub-tropical horticultural research, production and marketing in the Transvaal and attended the short course in citriculture at the Nelspruit Research Institute.

The new post of Advisory Horticulturist, Matabeleland and Midlands, was filled by the transfer of the Horticulturist from Melsetter and a Horticulturist was recruited during the year to bring the establishment up to strength.

The horticultural industry continues to expand and services have had to be increased proportionately. Lectures, talks, short courses and demonstrations have been given by the staff as well as two television appearances and show judging.

PUBLICATIONS

A paper 'Climatology in relation to fruit and vegetable production in Southern Rhodesia' was presented at the Departmental Conference by the Senior Horticulturist. Other publications included 'Coffee growing in the Eastern Highlands', 'Hints in planting sub-tropical fruit trees', while numerous letters, articles and reviews were written on fruit and vegetables.

AGRICULTURAL EXPERIMENT STATION, SALISBURY

Although the rainfall total of 40.43 in. which fell between the 1st October and the 30th April was 8 in. above normal it was not well distributed over a long growing season and, as a result, the yields from a number of crops, and in particular maize, were rather disappointing. The planting of critical trials was not possible until the 17th of November but, from then onwards it was able to continue without interruption. Twenty inches of rain fell during December, making weed control extremely difficult and, if the appearance of maize was any indication, was responsible for abnormally high losses of nitrogen through leaching. Probably the factor chiefly responsible for limiting yields was the lack of effective rain during March when maize and soya beans were at a critical stage and there were no effective falls in a monthly total of less than 1½ in.

MAIZE

During 1962 plans were finalised for the handing over to the Seed Maize Association, operating in conjunction with the Salisbury Farmers' Co-op., of the responsibility for the multiplication of inbred, and the making of single hybrid, parent seed, previously a function of Government. Panmure Hybrid Maize Farm was closed and offered for lease and all stocks of seed on hand at Panmure were sold to the new organisation at mutually agreed prices. Thus, for the first time, the staff of this station was not directly concerned with the planning of the multiplication programme, inspection of the seed plots and the rogueing of off-type plants during the growing season and off-type ears at harvest. However, on a number of occasions assistance was given to the inspectors of the Association when they were in difficulty over the identification of out-crosses in the various inbreds.

Sales of hybrid maize seed for planting in the 1962/63 season fell by 10,618 pockets to 77,570 pockets (100 lb.) of which approximately 15,000 were sent to Northern Rhodesia. The demand for seed of the single hybrid S.R. 52 far exceeded supply and production of this variety was accordingly increased to the maximum possible with the parent seed available. At the same time seed of the two inbred parents of this hybrid was multiplied to allow for still further expansion. As a result there will be approximately 13,000 pockets of S.R. 52 for planting commercially in the 1963/64 season and it is estimated that the available quantity of seed of the two inbreds, N3-2-3-3 and SC5522, is sufficient to produce 50,000 pockets of S.R. 52 for planting in the 1964/65 season.

Variety trials were conducted at 28 centres throughout Southern and Northern Rhodesia. The open-pollinated variety, Southern Cross, the three double hybrids, S.R.10, S.R.11 and S.R.13, and the single hybrids, S.R.51, S.R.52 and S.R.53, were included in all trials. In addition, a number of experimental hybrids were tested at some of the centres, usually wherever the trial was located on a research station. The yields given are the mean from all trials.

MEAN YIELDS OF MAIZE

(in bags of 200 lb. per acre)

S.Cross	*S.R.10*	*S.R.11*	*S.R.13*	*S.R.51*	*S.R.52*	*S.R.53*
25.43	26.69	27.21	32.34	31.39	36.78	34.42

In a large majority of centres S.R.52 gave the highest yield of all varieties although, in some centres, its superiority over S.R. 13 was not greater than one to two bags an acre. At the present price per 100 lb. pocket of £9 10s. for single and £2 10s. for double hybrid seed it costs between 25s. and 30s. an acre extra to use single hybrid seed with normal seeding rates. This is only economic when an increase in yield of at least a bag and a half an acre is obtained. It is impossible to forecast the eventual demand for seed of S.R.52; no doubt a reduction in price would encourage its more extensive use. Yield comparisons of the seed parents of S.R.11, S.R.13 and S.R.52 on this station suggest that this is likely to be possible without making the production of single hybrid seed uneconomic or less profitable than that of double hybrid.

The season saw the inauguration of a second main breeding programme, initially to be confined to the breeding of yellow varieties, on Henderson Research Station. An additional plant breeder was appointed and stationed at Henderson and it is intended that the work at Salisbury and Henderson will be co-ordinated under a single direction. There is no doubt that it will become desirable in the future to maintain yellow and white nurseries at both centres so that it is possible to select, from all the material available, lines suitable for both the higher and lower altitudes, as represented by the two stations.

Apart from the conventional method of developing inbreds by selecting from a wide range of yellow open-pollinated varieties, which was started on a considerable scale this season, it is hoped to have yellow hybrid seed available at an earlier date by producing the yellow counterparts of the best of the present white hybrids. This work was started at Matopos and is being pressed forward at maximum speed by growing a second generation each year at the Sabi during the winter.

One part of the Salisbury programme which has received a great deal of attention in recent years has been the replacement of all those hybrids in commercial use which lack a reasonable degree of resistance to the leaf blight *Helminthosparium turcicum*. In this respect both S.R.13 and S.R.52 are an improvement on previously released hybrids; but S.R.11, when conditions are favourable for the development of the disease, is still subject to severe attack. A new and more resistant hybrid which is being tested experimentally has now shown sufficient promise in trials throughout the country to justify the bulking of seed of the two additional inbreds involved, as the first stage of putting it into production. If results in the coming season confirm those already obtained, steps will be taken to replace S.R.11 as quickly as possible. The new hybrid is of similar maturity rating to S.R.11.

The resistance of this new hybrid, and of S.R.13, will be improved still further when the development of a "recovered" version of the inbred A5-7-6, an inbred parent common to both hybrids, is completed. A Mexican line with a high degree of resistance transmitted by a single dominant gene is being used in this project. A further source of resistance, which can be transmitted similarly, has been obtained from Illinois. Both are likely to prove invaluable.

As mentioned in last year's report, attention is being paid to the development of hybrids with a higher oil content. As there is a close correlation between oil content and germ size, kernels with particularly large germs were selected from a number of open-pollinated varieties and planted this season. The strongest and most vigorous plants were selfed and these are being used in the development of new inbred lines. In each succeeding generation selection will be based on plant vigour and size of germ.

At one of the South African maize breeders' conferences, the Potchefstroom School of Agriculture agreed to maintain seed of all the known yellow and white open-pollinated varieties grown in South Africa. All plant-breeding centres were in agreement that this was most valuable and desirable and will ensure that all the available sources of germ plasm are maintained for future use. As Rhodesia will benefit as much as South Africa from this service it has been agreed that this station will assist in this work and so provide an additional insurance against the loss of any varieties. Accordingly, Potchefstroom has supplied seed of a very extensive range of varieties.

Two spacing trials were carried out with maize. In the first, four varieties, three of which are in commercial use, were compared at five population levels for the second successive season. Once again results from this trial show the very substantial effect of population on yield and that the optimum population is not the same for all varieties. S.R.52 has responded to an increase in population to a greater extent than the shorter and quicker maturing S.R.11. It has out-yielded S.R.11 by 19.4 per cent. at the lowest and 34.9 per cent. at the highest population level and, in the presence of adequate fertilizer, has given an additional 16.69 bags to the acre when the number of plants is doubled.

MEAN YIELDS FOR THE TWO SEASONS: 1961-62 AND 1962-63

(in bags per acre)

	Plant Population per acre				
Hybrid	*9,680*	*12,100*	*14,520*	*16,940*	*19,360*
S.R.11 . .	33.87	39.56	42.18	41.90	42.37
S.R.13 . .	37.82	43.66	46.27	50.63	51.83
S.R.52 . .	40.45	45.63	51.49	51.37	57.14

The second trial compares four varieties of different habit of growth at three population levels and at three dates of planting. This season one variety was changed and all four are now single hybrids. Interactions between varieties, population and dates of planting have not been consistent from one year to another but the effect of date of planting is very clear. The yields tabled are the mean of the four varieties grown each year. Combining the results for the three seasons the average yield has dropped by 3.10 and 7.02 bags per acre respectively from the first to the second, and the second to the third, date of planting. This confirms the experience of earlier trials; delays in planting are progressively more harmful as the season advances.

MEAN YIELDS OF FOUR VARIETIES

(in bags per acre)

Date of Planting	*Yield*	*Date of Planting*	*Yield*	*Date of Planting*	*Yield*
14-11-60	37.27	13-11-61	43.29	19-11-62	38.25
28-11-60	37.19	27-11-61	40.31	4-12-62	32.01
12-12-60	30.76	9-12-61	32.92	17-12-62	24.77

Results from the fertility and rotation investigation confirm those of previous years rather than provide anything new. Yields from the old classical and rotation plots were the lowest for many years. The control plots in the main nitrogen trial yielded only 12.80 bags per acre, and responses as high as 18 bags per acre were obtained from those treatments where at least part of an application of 100 lb. of nitrogen is given at planting. Responses of this magnitude are unusual at Salisbury. Elsewhere, symptoms of nitrogen deficiency were most marked where all the nitrogen had been broadcast and ploughed under during the dry season. Much of it may have been inverted to the bottom of the plough furrow and washed still deeper by the heavy December rains before the young maize roots could reach it. There were small increases in yield from residual nitrogen applied the previous season, but they were not large enough to be significant statistically.

For the second time yields of soya beans, introduced for rotational purposes, were not affected adversely by the use of the crop residues from the previous maize crop as a stubble mulch. This trial was started in 1954/55 and on all seven occasions when maize was grown the yield from the stubble mulch plots has been lower than that from both the plots in which the residues are annually ploughed back and from those where they are removed and replaced by an annual dressing of two tons of kraal compost to the acre. Mean yields for maize and soya beans since 1954 are as follows:

MEAN YIELDS

(in bags of 200 lb. per acre)

Crop	*Control*	*Stover ploughed back*	*Stover stubble mulched*	*Stover removed Kraal compost applied*
Maize (7 crops) . .	24.62	26.24	23.80	26.57
Soya beans (2 crops) .	7.23	7.80	7.95	7.60

In this investigation the different treatments are conducted on the same plots each year so that there is a cumulative as well as a direct effect. Adequate phosphates and potash, and nitrogen at the rate of 100 lb. N per acre is applied annually to all plots except that the quantity of nitrogen is reduced when the legume is grown. With all stover treatments the effect of the application of the 100 lb. nitrogen is compared when it is all ploughed under during the winter, when it is all applied as a top-dressing six weeks after planting the maize and when half is applied in the winter and half as a top-dressing six weeks after planting. The yields below are the mean for all seven seasons.

MEAN YIELDS FOR SEVEN SEASONS

(in bags of 200 lb per acre)

Time of applying N	*Control*	*Stover ploughed back*	*Stover stubble mulched*	*Stover removed Kraal compost applied*
Winter	25.32	27.17	23.10	24.86
Summer . . .	24.41	25.73	24.52	26.45
Half and half . .	24.67	26.41	24.69	27.76

A greater response to the nitrogen has been obtained in the case of both the control plots and the plots where the stover is ploughed back, when it is applied during the winter at the time of ploughing. On the other hand, the nitrogen has been more effective on the stubble mulch and kraal compost plots when applied in the summer and still more so when it is split and applied half in the winter and half in the summer.

POTATOES

It was not possible to fill the vacant post of Potato Breeder, following Mr. Montague's resignation, in time for the 1962/63 growing season and, in consequence, the potato programme had to be curtailed. The best of the seedling material from crosses made in 1960 and 1961 was divided so that part could be grown for observation purposes on this station and part maintained under virus-free conditions on high land at the Rhodes Inyanga Orchards. On the basis of yield and tuber characters the performance of several of the seedlings was not sufficiently promising to warrant their being grown again and they will be discarded.

It has been decided to multiply seed stocks of the most promising lines so that they can be yielded accurately in replicated trials and Mr. Montague and Mr. Storrer have agreed to do this where two crops can be grown a year under supplementary irrigation with no danger of contamination from bacterial wilt.

Stands in the fertilizer trial were generally poor and, in consequence, it was not possible to obtain valid results. Inferior seed of the variety Pimpernel was responsible and it is intended to obtain fresh seed, if possible, of the variety Walanga for the trial next season. The crop made poor growth.

WHEAT

Unfortunately, farmers with the necessary irrigation to grow wheat have not shown the same vigour and enthusiasm with which the breeding programme is conducted every year and the acreage planted to the crop in Southern Rhodesia remains disappointingly low. So much of the country is ecologically unsuitable for the growing of summer wheat, because summer temperatures are too high or the season too short, that production in Rhodesia is likely to be confined chiefly to the winter crop grown under irrigation. Therefore, the emphasis in breeding is on the development of winter wheats with the second generation each year providing sufficient information on the adaptability of all the available material if any of it is required for a summer crop.

During the year an increase in the number of races of stem rust has become evident with an accompanying decline in the apparent resistance of some of the varieties. This happening is common to all wheat-growing countries and the policy of keeping a very wide range of material in the nurseries and of releasing a number of the more promising varieties for seed multiplication seems the wisest means of insuring against the sudden appearance of additional races. In pursuance of this policy one or two more varieties will be released in the near future.

The superiority of the varieties developed by the Wheat Breeder over Punjab 8A, the old standard and widely used variety, is frequently only apparent when, by increased applications of fertilizer, they are grown at a high-yield level. Within limits, wheat-growing is a sounder proposition at a high-yield level because, per bag of wheat, this reduces the cost of irrigation, the most important single item of expenditure. But heavier applications of fertilizer and higher yields make strength of straw essential and therefore great stress is being paid to this in the breeding programme. Both the dwarf Japanese variety, Norin 10, and an Italian semi-dwarf variety are being used extensively in the development of varieties with a short, strong straw.

In the winter of 1962 all the more important varieties were compared at three dates of planting, the 4th of April, the 25th of April and the 16th of May. For all except two particularly late varieties, the 25th April proved the optimum date of planting. These results confirm that late April or early May is the ideal time for planting winter wheat.

In marked contrast to many of the other crops being grown on the Station, the summer of 1962/63 proved very favourable to wheat and yields were higher than usual. The fact that temperatures were a little lower than normal may have been responsible. Twelve of the 24 varieties entered in the replicated yield trials yielded over 12 bags an acre and the top variety gave 14.7 bags an acre. The 1963 winter crop promises well but, as harvesting has not yet started, no results are available. Some of the earliest material was damaged by frost.

BARLEY

This crop is receiving increased attention as the Californian six-row variety, Atlas, at present the most widely grown variety in the country, has not proved entirely satisfactory for the production of malt. Because they give a more uniform sample of grain, the industry prefers two-row barleys, but so far no two-row introductions have given really satisfactory yields. The main objective in the breeding programme is to develop a two-row variety with a short, strong straw and giving a yield competitive with wheat. Some dwarf material from the Far East has been obtained and is being used to reduce the height of the higher-yielding introductions. None of the available barley varieties gave yields comparable with those from the better wheat varieties in the 1962 trials, although there are indications from the Sabi that, in the lowveld, barley yields compare more favourably, probably because the higher temperatures are less favourable to wheat.

Barley is grown under contract and local malting facilities are limiting the market. Until these are extended, making it unnecessary to import a considerable part of the requirements of the breweries, barley production is likely to remain on a small scale.

LEGUMES

The post for a Plant Breeder to work on leguminous crops is not yet filled but it is hoped that it will be before the start of the 1963/64 season. A number of trials were carried out with groundnuts, soya beans and velvet beans and the two latter crops, as well as sunnhemp and *Crotalaria ochroleuca*, were grown for green manure purposes.

Considerable interest is being shown in the production of soya beans at the present time. Very extensive markets are available and it remains to be seen whether at the prices offered farmers are able to obtain yields high enough to make the growing of the crop attractive and economic. Between them the Gatooma, Grasslands and Salisbury stations have collected a very extensive range of varieties, some of which show considerable promise, particularly the earlier maturing ones which are most suitable for areas having a shorter growing season than is necessary for the Hernon varieties. Nevertheless, it is likely that optimum yields are only possible from varieties bred and selected for the Rhodesian environment and it is intended that soya bean breeding will receive priority as soon as the post of Legume Breeder is filled.

Twenty-five varieties were grown in a replicated yield trial this season and a large number of introductions were screened, some for the second time, in single observation plots. Taking into account the inadequate rains in the latter part of the season, yields were satisfactory. For the first time some of the South African introductions from Potchefstroom, such as 56S30, 54S70 and 59S143, gave higher yields than Hernon 147 and Hernon 135, probably because the season favoured the quicker maturing varieties. The three South African varieties all yielded over 11 bags an acre. Hernon 147 yielded 9.66 bags an acre and Hood 8.13 bags an acre. In the introduction plots the early maturing variety, Hill, looked very promising and yielded nearly 13 bags an acre. It has a very small seed.

In co-operation with the Grasslands Research Station, an investigation was conducted to compare the efficiency of a number of strains of soya bean rhizobia. Although a piece of land in one corner of the station, believed not to have grown soya beans before, was chosen for this investigation, the differences in yield from the various treatments were very small and not statistically significant. The growth, colour and nodulation of the soya beans was uniformly good throughout the trial, presumably because the local strain of rhizobia is reasonably efficient and is widely distributed over the station.

After a preliminary screening in observation plots for two years, the most promising of a number of fresh selections from the old varieties were included in the 1962/63 velvet bean trial. In some cases they out-yielded the parent variety from which they were selected; but results were variable and they will need further testing. All varieties were grown at a spacing of 3 ft. x 18 in. (two seeds per hill), the spacing which has been recommended for many years and which has proved in recent trials at least as good as others involving higher plant populations.

In general, groundnut varieties gave only half the yield they had produced in 1961/62 and Indian Coromandel, a variety with a semi-prostrate habit of growth, proved superior to Makulu Red, Natal Common and both Virginia and Spanish Bunch.

Grown for ploughing under as green manure in preparation for maize trials, velvet and soya beans grew well, but not the *Crotalarias juncea* (sunnhemp) and *ochroleuca, C. ochroleuca,* in the initial stages always slow growing, was unable to survive strong competition from weeds during the wet weather in December and was ploughed under early in the New Year so that the land could be resown to sunnhemp.

GENERAL

By contributing articles for publication and attending farmers' meetings as well as by giving advice to individual farmers on specific problems, the results from research on the Station were made available to the farming public. Members of the staff served on a number of departmental and outside committees and judged the maize and produce classes at several agricultural shows. The Officer-in-Charge visited the Northern Transvaal with other officers from the Ministry to report on the latest castor bean developments in South Africa.

EASTERN HIGHLANDS RESEARCH STATION — MELSETTER

INTRODUCTION

The Research Station serves the Eastern Border Highveld, classified as Natural Area 1B in the Agro-Ecological Survey of Southern Rhodesia. This is an area of over one million acres, much of which is mountainous; but there is a substantial arable acreage which, due to soil and climate, is suitable for intensive farming.

The change in Station policy which took place at the end of last year was designed to fit more closely with the present requirements of the area. The switch to beef away from dairy work and the beginning of horticultural investigations have generally been approved by the farming community.

GENERAL

Staff.—There were no staff changes during the year.

Labour.—Numbers fluctuated between 25 and 30 with a firm nucleus of 10 Africans who have been employed for more than three years.

Building.—A home-made, forced-draught grass drier was constructed, which greatly assists in dry matter determination.

A cattle-weighing scale was bought and established in the dip-camp. Cattle-holding pens were constructed adjacent to the scale.

The Ministry of Water Development installed a piped water system for domestic use in the staff houses.

Field-days and visits.—A successful field-day on 'Beef from Pastures' was opened by the President of the RNFU on the 9th April; 60 people attended. During the year 196 visitors came to the Station. The Officer-in-Charge visited 15 farms, attended two agricultural shows, two beef discussions and one fruit field-day.

Conferences.—The Officer-in-Charge attended the Professional Officers' Conference at Gwebi Agricultural College from the 30th to the 31st May, and the Pasture Officers' Conference at Grasslands Research Station from the 15th to the 16th August.

WEATHER

A record summer rainfall was followed by an exceptionally dry winter, characterized by less 'guti' and more severe frosts than is usual.

	Inches	*Rain days*	*13-yr. Average*
Oct. 1962 - April 1963 . . .	57.96	103	38.70
May 1963 - Sept. 1963 . . .	1.83	16	3.64
Year's Total	59.79	119	42.34

BEEF

This year saw the first batch of Hereford steers go to slaughter from improved pastures. The results were encouraging; 63 per cent. were graded 'Rhodesia's Best', 21 per cent. Imperial and 16 per cent. Standard A after a 20-month period on the Station.

On arrival as weaners, their average weight was only 335 lb. and they were subjected to a variety of experimental feeding treatments; the very wet summer and a high incidence of Ephemeral Fever were among factors adversely affecting the cattle.

The exploratory nature of the investigations with this first group of steers has fulfilled its purpose. The broad indications are that good-quality weaners weighing 450 lb. can be taken to slaughter weighing 1,100 lb. in 17 months from a small area of improved pasture and grade 'Rhodesia's Best' during the high-priced summer period. To achieve this, it is necessary to keep the animals growing at a rate of 1 lb. a day during the winter and 2 lb. during the summer. These rates of gain have been reached and in some cases exceeded on the Station. One individual weighing 325 lb. as a weaner in mid-October scaled 1,273 lb. 19½ months later. This steer graded 'Rhodesia's Best' with a carcass of 662 lb. cold dressed weight, and its average daily live-weight increase over the whole period was nearly 1¾ lb. The weaning weight was poor and, in consequence, the date of slaughter was after the high-priced period. This shows the importance of starting with well-grown weaners around 450 lb. in weight.

Kikuyu/clover pastures have carried 1½ steers to the acre during the 150-day summer without the help of artificial nitrogen. However, to balance the grazing pressure and to secure the maximum output from the grass it is evident that sheep are a necessary complement to the cattle. A stocking rate of one steer to the acre will allow three sheep to graze in addition as scavengers after the cattle. It is probable that by pushing up the stocking rate in this way the output per acre of grass will increase and even higher sheep numbers may be able to be carried in future. The efficiency of some modern drugs for control of internal parasites has made this intensification of stocking permissible.

After the summer period the winter has been successfully provided for by foggage grazing of Napier fodder *(Pennisitum purpurium)* or Sabi Panicum. Perennial legumes such as dahl *(Cajanus indicus), Desmodium discolor* and *D. intortum* provide very useful protein feed, though the last two have yet to be tested on a field scale at Melsetter. Cotton-seed direct from the ginnery was used successfully as a protein supplement during the 1963 winter. The best winter gains, however, were from Napier fodder foggage grazing without supplementary feeding. A group average daily gain of 0.97 lb. over 18 weeks, with individuals averaging 1.21 lb. daily, was recorded. Napier fodder fits into the system very well as the silage cut taken in February provides the bulk-feed for the newly arrived weaners during their first winter and the aftermath is available for animals in their second winter.

For final fattening the steers return to Kikuyu-clover pastures with a balancing ration of maize meal for a six- to eight-week period. During the coming summer, types and quantities of supplementary feeding will be investigated.

Target weight gains are shown with bracketed figures giving the performance achieved by individauls.

From weaning to entering summer pasture . . .	1 *lb. per day* (1.2)
150-day summer period	2 *lb. per day* (2.2)
214-day winter period	1 *lb. per day* (1.1)
6- to 8-week final fattening on pasture with maize meal ration	2 *lb. per day* (2.4)

Beef off Veld

A trial to test the capacity of Melsetter veld in relation to beef production was started in December 1962. Paddocks were stocked at the rates of 6, 10 and 14 acres to the beast. Weight gains and losses are recorded as follows.

Stocking	*Av. daily gain Summer, 1963*	*Av. net loss June-Sept.*	*Av. daily loss 21 May-13 Aug.*	*Av. daily gain 13 Aug.-24 Aug.*
6 : 1	1.14	22	0.31	0.31
10 : 1	0.99	14	0.47	0.83
14 : 1	0.95	+3	0.13	0.55

Winter weight losses occurred, although during this period the steers received 1½ lb. per day cotton seed. Without this ration the weight loss would have been greater and the recovery in August and September less marked. The cost of the feed was just under 4d. per head daily.

It is interesting that during the summer the greatest weight gain occurred at the highest stocking rate, while in the following winter this pattern was reversed. It is too early to comment upon the effect of the grazing pressures on the veld except to say that cattle tracks have appeared and on steep slopes these may present an erosion problem in due course.

SHEEP

An attempt to rear worm-free lambs for use on parasite-free pastures was unsuccessful. Within three months of being put on 'clean' pastures 15 per cent. showed parasite infection. As the remainder became infected the trial was abandoned.

Autumn Lambing, April 1963

Thirty-three ewes produced 34 lambs on irrigated rye-grass pastures and a forward creep system was employed with the lambs being fed ¼ lb. maize meal daily. The average birth weight was 9.5 lb. with a maximum of 12.6 lb. All wether lambs have been retained in order to build up sheep numbers rapidly.

The flock, which was split into spring and autumn groups two years ago, is now being brought back to one unit, lambing in October. This is considered more suitable and fits in better with the pasture feeding of beef.

Parasite Control

The flock was grazed round pastures on a three-day shift basis for internal parasite control during the last year. The system worked well and the flock appeared to thrive. However, newer anthelmintics now available allow the movement of sheep to be dictated by good pasture management rather than by the needs of parasite control.

WOOL

The 1962 clip averaged 4.0 lb. per sheep and was sold for 3s. 6d. per lb. to a local firm. The 1963 clip averaged 4.47 lb. per adult and 3.90 lb. per gimmer.

FIELD INVESTIGATIONS

LIME REQUIREMENT TRIAL

This was designed to measure the lime requirement under high-rainfall conditions to stabilize the soil pH at a level suitable for grass/clover pastures with a five-yearly arable rotation.

Potatoes showed a slight increase when two tons of lime per acre were applied, but one and three tons lowered yields. The pH movement five months after lime application is shown as follows:

Lime (Tons)	*ph* $(CaCl_2)$	*pH increase above 0 Tons*
0	4.57	—
1	5.02	0.45
2	5.68	1.11
3	5.80	1.23

The trial continues under a Kikuyu/clover cover and will be assessed again in the coming season.

FEDERAL LUCERNE VARIETY TRIAL (DRY LAND)

This trial is now completed having been yielded for three years. The order of merit by varieties is given as follows:

Variety	*Ton dry weight/acre mean of three years*
S.A. Standard	2.514
Africa	2.371
Hairy Peruvian	2.182
Hunters River	2.043
New Mexico	1.852
De Puits ..	1.763
Caliverde	1.640
India.	1.053

CLOVER ESTABLISHMENT TRIAL

This was conducted on dolorite- and Umkondo-derived soils. It was designed to compare three levels of lime and phosphate applied to three species of clover; East African White *(Trifolium semipilosum)*, East African Red *(Trifolium reupellianum)* and New Zealand Wild White *(Trifolium repens)*.

Results indicate that:

1. The response of the East African species to both lime and phosphate is greater than that of the *T. repens*, and in the absence of these their performance was still better than the best of the *T. repens*. It seems that the East African clovers are better suited to Melsetter conditions and they may be capable of worthwhile production with only small fertilizer dressings.
2. The East African clovers benefited more from phosphate dressings than they did from liming.
3. The Umkondo soils showed greater response to both phosphate and lime than did the dolerite.

OBSERVATION TRIALS

NEW ZEALAND FLAX *(Phormium tenax)*

Two-and-a-half-year-old plants are growing well, particularly in vlei ground. This is showing promise of being a useful fibre crop in suitable vlei areas.

LINSEED *(Linum usitatissimum)*

Small plot trials indicate that this may be a well-adapted oil-seed crop for the area. Three newly introduced varieties planted as a winter irrigated crop are growing well. They will also be tried under dry-land conditions in the summer.

VELD IMPROVEMENT

1. Kikuyu grass and *T. repens* introduced into burnt veld two years ago are growing well. The clover has thrived despite two exceptionally dry

winters. Heavy grazing, together with mowing, is controlling the regrowth of veld grass and shrub species, while Kikuyu is establishing itself steadily.

Small-scale tests showed that chopped Kikuyu runners broadcast on the surface will establish themselves very satisfactorily if trodden in by cattle. This method will be tried on an area of burnt veld in the coming season.

2. Dahl *(Cajanus indicus)*, when planted in the veld as a protein browse for cattle, should be fenced in order to control the grazing. Where unimpeded access was allowed during the last winter the dahl was eaten almost exclusively and the veld ignored.

LEGUMES

Leucaena Glauca

Five varieties of this shrubby legume are growing in nursery beds. When suitably pruned they are excellent shade trees for coffee. *Leucaena glauca* is also a useful proteinaceous fodder plant.

Horse Marmalade *(Desmodium discolor)*

Although this has grown well in small plots, there has been difficulty in establishing it on a field scale.

Desmodium intortum

Seedlings planted out late in the summer suffered from frosting and drought, but have shown remarkable tenacity. The indications are that this will be a very useful perennial legume crop.

HORTICULTURE

This section is included in the report of the Chief Horticulturist.

GATOOMA RESEARCH STATION

INTRODUCTION

This report represents mainly an abridged account of important results from the research work conducted by Mr. J. P. Tunstall and Mr. G. A. Matthews, Entomologists, Cotton Pests Research Scheme; by Dr. F. E. M. Gillham, Cotton Plant Breeder; and by Mr. J. M. Burton, Agronomist responsible for experiments with cotton as well as other crops.

Since August 1960 and until March 1963, a period which embraces almost three crop-growing seasons, Mr. Burton has carried on a reduced programme of cotton plant-breeding trials, while Dr. Gillham was at North Carolina State College, United States of America, where he worked for and obtained a Ph.D. degree.

Mr. M. J. J. L. Straatman, Technical Assistant, arrived on first appointment on 1st December 1962.

Mr. R. H. Fitt occupied the newly created post of Cotton Advisory Officer from 1st January 1963.

RAINFALL AND CROPS

The total seasonal rainfall at the Gatooma Station, from the 1st October 1962 to the 30th April 1963 was 30.60 in. The total for 1961/62 was 27.61 in. and that for 1960/61 was 29.66 in. for the same period. The three totals are similar, and although distribution and, therefore, moisture varied within seasons, sometimes markedly, very good yields of cotton, averaging about 2,000 lb. seed-cotton per acre, have been obtained at Gatooma. This result is due mainly to the control of insect pests by using methods developed in recent years. Nevertheless, the efficacy of the methods has yet to be assessed under seasonal rainfall totals of either 40 in. or under 20 in. which extremes are occasionally experienced.

The salient features of the 1962/63 rainfall distribution were very good moisture conditions for planting and crop establishment in November and December 1962, during which experiments and bulk acreages of cotton and most other crops were sown over the period 8th November to 2nd December. However, as the total rainfall, 9.03 in., in December was accompanied by only three rainless days and a low mean sunshine record of three hours per day, lands tended to remain wet, but not unduly waterlogged, and some difficulty was experienced in killing weeds. February, one of the inportant months for flowering in cotton, also had a low mean sunshine record, one of 4.6 hours per day, and this caused noticeable shedding of young bolls. Following February, total rainfall in March was only 0.98 in. and crops appeared to be somewhat short of moisture except that cotton and castor beans were least affected. In April, however, falls of 1 in. to 1.5 in. of rain about the middle of the month definitely assisted boll development in cotton. Subsequently, part of the later crop of bolls was lost, due to persistently low winter temperatures in May, June, and July. In certain areas yields were reduced appreciably by frost damage.

COTTON YIELDS

Sprayed cotton at the Gatooma Station, whether grown in bulks or experimental plots, produced yields of the order of 2,000 lb. to 2,500 lb. of seed-cotton per acre. In a few instances yields were either below or above this range but not markedly so. In contrast, yields from unsprayed cotton plants varied from 18 lb. to 360 lb. seed-cotton per acre. The yield of maize grown in bulk acreages at Gatooma varied from 18 to 22 bags per acre.

In the commercial cotton crop amounting to approximately 6,000 acres in Southern Rhodesia, virtually all of which was sprayed, the level of yield was high. Several dryland crops approached or even exceeded 2,000 lb. seed-cotton per acre. The mean yield of the Southern Rhodesian crop as a whole is estimated at 1,340 lb. seed-cotton per acre. This yield would have been greater had not unusually cold winter temperatures, with frost in certain areas, been experienced. The total number of bales actually ginned (not including a comparatively small quantity of seed-cotton received after ginning ceased) was 7,130 x 400 lb. bales of lint. This is a substantial increase on the mean of 1,750 bales produced in the three previous years 1960-1962 inclusive. The increase is due to greater interest shown by farmers in cotton growing following a decline in the price realized for maize, and also to appreciably higher cotton yields which are being obtained by the control of insect pests.

Of the 7,130 bales ginned in 1963, Class 'A' cotton accounted for 82 per cent., Class 'B' for 15 per cent. and Class 'C' for three per cent. Furthermore, of the total cotton ginned in 1963, the dryland crop grown in the Middleveld accounted for 88 per cent., and irrigated cotton, produced mainly in the Sabi lowveld, for 12 per cent.

MAIN RESULTS FROM TRIALS

Insect Pests Control

A variety of cotton spray machinery including knapsack, tractor and high-clearance machines, and portable line systems, all equipped with the tailboom spray distribution system, has been tested, found suitable, and is now available, according to the requirements of individual growers.

In first experiments, a highly micronized DDT wettable powder (75 per cent. active ingredient) has been shown to be as effective as the DDT miscible oil in the control of *Heliothis* (American bollworm). Further trials are necessary over a range of climatic conditions before definite recommendations can be made. Growers who may decide to apply the less expensive DDT 75 per cent. have been advised to ensure that stocks of the DDT miscible oil are readily available in case it is found necessary to revert to the use of the latter.

Carbaryl (one formulation of which is the insecticide sevin) has been found to be more toxic than DDT to *Erias biplaga,* the Spiny bollworm.

Results obtained from different insecticide trials, in which treatments included timing, concentration and rates of application, though in certain instances promising, require confirmation. Meanwhile very good results are being obtained by applying the present recommendations for the control of cotton insect pests.

Cotton Plant Breeding

The Gatooma-selected cotton strains S58/81 and S58/83, both derived from Albar 627, have been formed into a multiline strain numbered G.R.S. 632. Seed is being increased on approximately 50 acres under irrigation at Mutema in the Sabi Valley. The lint will be submitted to exhaustive tests in 1964 before further multiplication is contemplated.

Cotton Agronomy and other Field Trials

An inter-row spacing of 3 ft. and an intra-row spacing of 6 in. to 9 in. in cotton are being advised in view of experimental results.

One of several advantages of the closer 3 ft. x 6 in. to 9 in. spacing is that flowering is produced earlier and over a shorter period than at wider spacings. Although fewer bolls are produced per plant at the closer spacing this is more than compensated in yield by having a greater number of plants per acre.

Worthwhile responses to fertilizer applications, particularly nitrogen, have been obtained in certain trials with cotton.

The mean yield in a DDT-sprayed castor bean trial was 2,620 lb. of beans per acre. Pacific Hybrid 192 produced the highest yield namely 3,696 lb. beans per acre. This was significantly greater, at 1 per cent., than other 11 varieties in the trial. Again, in a DDT-sprayed Nitrogen x Spacing Trial the mean yield was 2,374 lb. per acre. In view of these yields, the castor bean insect pests/diseases complex merits detailed investigations, which are not at present possible at Gatooma. The crop is drought tolerant and persistent in yield even after seasonal rains have ceased.

Mean yields in soya-bean trials, whether variety or other, ranged around ten bags of beans per acre. In one variety trial Columbia M8A was top-yielder with 13.4 bags per acre. This yield was not significantly greater than that of Salisbury 279 (11.1 bags) but it was so over the four other Salisbury varieties in the trial, namely numbers 147, 107, 135, 237. In a second trial, Australian Mamloxi (NS59/72), with 12 bags beans per acre significantly outyielded other 15 varieties including the five from Salisbury, already listed.

COTTON INSECT PESTS CONTROL

Further work on the ovipositional response of *Heliothis* (American bollworm) and *Diparopsis* (red bollworm) to cotton varietal differences, with particular reference to the degree of plant pubescence, has shown that natural field populations of *Heliothis* moths tend to avoid ovipositing on glabrous cotton. This confirms the results of cage experiments conducted in 1961/62. There is an indication that this non-preference is maintained when plots of the different varieties are separated by a distance of fifty yards. These investigations will be continued. No preference for certain varieties was shown by *Diparopsis*.

Observations on the site of *Heliothis* egg placement indicate that the majority of eggs are laid on the upper half of the plant, a preference being shown for stems, petioles and peduncles. This will require vertification in different types of plant growth and over further seasons before recommendations can be contemplated.

Carbaryl, one formulation of which is the insecticide sevin, has been found to be more toxic than DDT to *Erias*.

A highly micronized DDT wettable powder (75 per cent. active ingredient) has been shown to be as effective as the DDT miscible oil formulation in the control of *Heliothis*, but further tests are required to confirm definitely that the efficiency of the wettable powder is maintained over a range of climatic conditions. The DDT wettable powder is less costly and also easier to distribute when used in African agriculture than the miscible oil formulation.

In one experiment the endosulfan formulation, Thiodan 35 E.C., when compared with various preparations of carbaryl, two carbamates other than carbaryl and a mixture of carbaryl and DDT gave the highest yield, solely on account of the more efficient control of *Heliothis*. However, endosulfan is appreciably more toxic to humans than DDT which is at present recommended for the control of *Heliothis*.

Different experiments were carried out to determine whether improvements can be made either in the timing of the commencement or termination of spraying, or by lengthening the interval during the latter part of the spray programme or by altering the rates of application and the concentration of sprays. The results obtained require confirmation before there can be justification to amend materially present recommendations for the control of cotton insect pests.

An Extension Trial in which sprayed plots, treated according to recommendations, were compared with unsprayed plots gave the following yields, which obviously are quite definitely in favour of spraying.

	lb. of seed cotton per acre		
Site	*Sprayed*	*Unsprayed*	*Diffs.: for Sprayed*
Nyanyadzi	2,996	1,230	1,766
Gatooma Station 1	1,941	18	1,923
Gatooma Station 2	2,642	306	2,336

Seed-cotton from the unsprayed plots was more heavily stained.

A variety of spray equipment incorporating the Gatooma tailboom spray distribution unit, mounted either on single knapsack sprayers, or on a high-clearance machine, or on tractors, or animal-drawn machines or used in portable line systems has been developed and tested on a field scale. Mean yields obtained in large plots of approximately two acres were uniformly high at 2,500 lb. seed-cotton per acre for all types of equipment. Ninety-nine per cent. of the cotton was graded Class 'A' at the Ginnery, Gatooma.

COTTON PLANT BREEDING

District Variety Trials

Mean yields of *lint* per acre were: at Eiffel Flats Gatooma, 446 lb., at Fort Victoria (irrigated) 714 lb., at Gatooma Research Station 685 lb., at Henderson Research Station 580 lb., at Sabi Valley Experiment Station (irrigated) 1,214 lb., at Mount Makulu Research Station (Northern Rhodesia) 532 lb. The mean yield of *seed-cotton* per acre at Magoye Experiment Station (Northern Rhodesia) was 1,199 lb.

The strains S58/81 and S58/83, both derived from Albar 627, did not show the clear-cut improvement over Albar 637 that was evident in previous years, but in view of their performance over a three-year period, they have been formed into a multiline strain numbered G.R.S. 632, and the seed has been sent to Mutema-Tawona in the Sabi Valley for increase. Lint from this increase will be submitted to exhaustive fibre and spinning tests in 1964.

Highly significant differences in lint length in the different District Variety Trials were found. The longest lint came from Sabi Valley Station followed by Fort Victoria, Mount Makulu, Gatooma and Henderson.

Of the strains under test the longest lint was produced by the two BMA strains, S57/135 and S58/88, followed by the Albar 627 strains, S58/81 and S58/83. The shortest lint was produced by S58/74, a selection from Albar 637.

The strongest lint was produced at Gatooma followed by Sabi Station, Henderson, Fort Victoria and Mount Makulu. Differences between centres were significant.

The two Albar 627 strains, S58/81 and S58/83, produced the strongest lint followed in order by Albar 637, S58/74, S58/88, S58/76 (*ex* Albar 637), Acala 442, S57/135, and Arkott.

COTTON AGRONOMY

Unless stated to the contrary Albar 637, acid delinted seed, was planted in the cotton agronomy trials.

Spacing Trial I.

Treatments: inter-row 2 ft. 6 in., 3 ft., 3 ft. 6 in.; intra-row 6 in., 12 in., 18 in. each with one plant per station. Planted 9.11.62. Mean yield of trial, 2,454 lb. seed cotton per acre (s.c./ac.). Co-efficient of Variation (C.V.) 3.7 per cent. Results: There were no significant differences between intra-row treatments but variation between boll weights was marked, the 6 in. spacing producing a lighter boll than 18 in. The inter-row spacing of 2 ft. 6 in. with a yield of 2,560 lb. produced significantly (at the 5 per cent. level 't' test) more seed-cotton than either the 3 ft. (2,461 lb.) or the 3 ft. 6 in. (2,442 lb.). The inter-row spacings exerted less effect on bollweight than did the intra-row spacings.

Spacing Trial II.

Treatments: inter-row spacing 3 ft. only; intra-row 9 in., 15 in. (18 in. x 2 plants), (18 in. x 3), (24 in. x 3). Planted 8.11.62. Mean yield, 2,423 lb. s.c./ac. C.V. 2.6 per cent. Results: Although there were no significant differences between the intra-row spacings 9 in. (18 in. x 3), (18 in. x 2), (24 in. x 3) the trend was for the closer spacings to produce the greater yields.

Records and observations in the two cotton spacing trials were: The closer-spaced plants produced their flowers earlier and over a shorter period than the wider spacings. Vegetative (monopodial) growth was appreciably less on the closer-spaced plants and fruiting branches, bearing fewer bolls near to the main stem, were short. The fewer bolls per plant were more than compensated in yield by having a greater number of plants per acre. Where there were two or three plants per station they tended to grow away from each other. Spray coverage was probably increased by a reduction of vegetative growth and also by having only one plant per station at closer spacing. With more than one plant per station or at the wider spacings 'damping off' disease or termites would tend to cause greater reduction in plant stands. Closer spaced plants appear to have a 'shading effect' in reducing weed growth and this advantage could offset easier weeding within the row by hoe of plants at wider spacings.

In view of the foregoing results and observations, spacings in cotton of 3 ft. between rows and 6 in. to 9 in. between plants in the row appear to be optimum when the crop is grown under dryland conditions, other practices being favourable.

Population Trial.

Treatments: At seven to eight weeks after germination, plant stands in a machine-planted bulk of Albar 637 were reduced by thinning, for a second time, using random numbers, to 80, 70, 60, 50, 40 per cent. stands in relation to the control which produced a 97 per cent. stand at a commercial 3 ft. x 12 in. spacing. The trial was planted on the 9.11.62, thinned on the 9.12.62 and again on the 10.1.63. Mean yield 2,574 lb. seed-cotton per acre. C.V. 3.3 per cent. Results: The highest yield (2,747 lb.) was obtained from the 97 per cent. stand and there were no significant differences between this and the 80 and 70 per cent. stands. The lowest yield (2,321 lb.) was obtained from the 40 per cent. stand which, bracketed with the 50 per cent., gave significantly less seed-cotton than all other treatments. Nevertheless 2,321 lb. of seed-cotton per acre is considered a good yield by most standards!

Depth of Planting.

Treatments: Acid delinted cotton-seed dry-planted on the 27.10.62 at 1 in., 2 in., 3 in., 4 in. depths. Mean yield 2,223 lb. of seed-cotton per acre (C.V. 15.4 per cent.). Germination occurred 10.11.62. Results: The 1-in. planting depth gave the highest yield 2,808 lb. seed-cotton per acre in association with the highest plant stand 98 per cent. This yield result is significantly better at the 1 per cent. level than the 4-in. depth, of which the yield was 1,136 lb. seed cotton per acre and the stand 24 per cent.

Fertiliser Trial (Kenyemba Farm) with Supplementary Irrigation.

Treatments: Nitrogen as CAN applied at 0, 70, 140 lb. nitrogen per acre either all at planting, or half at planting and half at six weeks top dressed, or all at six weeks; phosphate applied at 0, 30, 60 lb. P_2O_5 per acre. Planted 12.11.62. Mean yield, 2025 lb. seed cotton per acre (C.V. 11.8 per cent.). *Results:* The response to nitrogen was significantly linear at the 1 per cent. level, ON being 743 lb. seed-cotton per acre less than 70 N which in turn was 519 lb. poorer than 140 N with 2.619 lb. seed-cotton per acre. There were no significant differences between either the times of N application or between the phosphate treatments.

Fertiliser Trial (Kenyemba Farm) Dryland Conditions.

Treatments: Nitrogen as CAN applied at 0, 40, 80 lb. nitrogen per acre either all at planting, or half at planting and half at six weeks top dressed, or all at six weeks. Planted 22.11.62. Mean yield 1,662 lb. seed-cotton per acre (C.V. 11.5 per cent.). *Results:* 40 N increased yield, significantly at the 1 per cent. level, by 451 lb. seed-cotton per acre over ON. However, 80 N decreased yield by 246 lb. seed-cotton per acre compared with 40 N. This latter result just failed to be significant at the 5 per cent. level.

Fertiliser Placement Trial.

Treatments: No fertiliser or 300 lb. 'M' (9.12.9) either placed or broadcast. Planted 8.11.62. Mean yield 2,654 lb. seed-cotton per acre (C.V. 2.8 per cent.). *Results:* The fertilizer whether applied, placed (2,795 lb. seed-cotton) or broadcast (2.738 lb. seed-cotton) produced significantly more seed-cotton, at the 1 per cent. level, than no fertilizer (2,429 lb. seed-cotton). Fertilizer also tended to improve the boll weight slightly.

Fertiliser/Variety Trial.

Treatments: Nitrogen as CAN applied at 0 and 50 lb. nitrogen per acre, phosphate at 0 and 30 lb. P_2O_5 per acre, and potash at 0 and 45 lb. K^2O per acre.

Cotton varieties Albar 637 and S58/81. Planted 8.11.62 (C.V. 7.2 per cent.). Mean yield 1,755 lb. seed-cotton per acre. *Results:* Phosphate at 30 lb. P_2O_5 per acre was the only treatment which increased yields significantly and that at the 1 per cent. level. In all instances, however, N, P and K applications, and especially P, increased boll weights in both varieties.

COTTON DEFOLIANT TRIAL.

Planted 9.11.62. Mean yield 2,191 lb. seed-cotton per acre (C.V. 5.97 per cent.). *Results:* Of the two defoliants 'Folex' and UC 20299, used for the first time at Gatooma, 'Folex' was the more efficient, as this chemical caused the whole leaves to abscisse whereas UC 20299 acted as a dessicant, 'freezing' the leaves on the plants.

TRIALS WITH CROPS OTHER THAN COTTON

SOYA BEAN VARIETY TRIAL 'A'.

Sixteen varieties. Planted 18.11.62. Mean yield 10.2 x 200 lb. bags per acre (C.V. 14.8 per cent.). *Results:* Of the 16 varieties compared there were no significant yield differences between the first four, namely, Colombia M8A (13.4 bags), Angola 279 (11.5 bags), Kenya ex Belgian Congo (11.2 bags), Salisbury 279 (11.1 bags). Also in this trial were the Salisbury varieties 147, 107, 135 and 237, all of which were significantly inferior in yield to Colombia M8A.

SOYA BEAN VARIETY TRIAL 'B'.

Planted 18.11.62. Mean yield 9.6 bags per acre (C.V. 2.6 per cent.) *Results:* The top yielder, and significantly so, above other 15 varieties in this trial was Australian Mamloxi (S59/72) with 12.0 bags per acre. Next in order were placed Salisbury varieties 147 (11.3 bags) and 279 (11.0 bags), Australian Avayelles (10.7 bags), Australian Congo (10.7 bags), and Salisbury 135 (10.5 bags), there being no significant differences in yield between the last four.

SOYA BEAN VARIETY TRIAL 'C'.

Planted 28.11.62. Mean yield 9.9 bags per acre (C.V. 6.13 per cent.). *Results:* Of six varieties compared, Hood (10.9 bags) was significantly superior to Salisbury Hernon 135 (9.8 bags); but Hood was no better in yield than either Geduld (10.0 bags) or Blyvoor (9.9 bags). Hood grown at Gatooma has a pronounced dwarf habit, bearing its pods near to the ground. Therefore, this variety appears to be unsuitable for mechanical harvesting, whereas Geduld and Blyvoor are superior in this respect.

SOYA BEAN TRIAL: TWO LEVELS EACH OF NITROGEN x POTASH x SPACING AND INOCULATION VS. NO. INOCULATION.

Variety Hernon 135. Planted 21.11.62. (C.V. 3.1 per cent.). Mean yield 10.4 bags per acre. The only significant result was that an inter-row spacing of 30 in. outyielded by 119 lb. bean per acre an 18-in. spacing.

SOYA BEAN, TIMES OF NITROGEN APPLICATION TRIAL.

Variety Hernon 135. Planted 17.11.62. (C.V. 2.67 per cent.). Mean yield 9.9 bags per acre. No significant results were obtained between the treatments (1) ON, (2) 30 lb. nitrogen per acre at planting + 30 lb. nitrogen at first flowers (3) 60 lb. nitrogen at planting (4) 60 lb. nitrogen at first flowers.

CASTOR BEANS.

All trials were "blanket' sprayed with 0.5 per cent. DDT miscible oil, on seven occasions at weekly intervals, commencing at first flowers. Although this treatment undoubtedly contributed to the high yields obtained, no critical work on the control of insect pests of the crop was possible at Gatooma.

CASTOR BEAN VARIETY TRIAL.

Planted 27.11.62. Mean yield 2,620 lb. beans per acre (C.V. 8.65 per cent.). *Results:* Of the 12 varieties tested, Pacific Hybrid 192 gave a mean yield of 3,696 lb. beans per acre. This yield was significantly greater at the 1 per cent. level than all other varieties. In fact the Pacific hybrids as a group were the five highest yielding varieties in the trial. The bushel weight of Pacific Hybrid 192 was 44 lb., compared with 40.5 lb. for the mean of the trial, and this variety also gave a mean shelling percentage of 69.2 per cent. compared with the mean of 67.4 per cent. for the trial.

CASTOR BEAN NITROGEN x SPACING TRIAL.

Variety Pacific Hybrid 6. Planted 10.12.63. Mean yield 2,374 lb. beans per acre (C.V. 6.57 per cent.). The only significant results were: (1) 60 lb. nitrogen per acre increased yield by 188 lb. beans per acre when compared with ON, and (2) the interaction (60 lb. nitrogen x 24) was significant at 1 per cent. level.

SUNFLOWER VARIETY TRIAL.

Eight varieties of 110 to 120 day maturity. Planted 21.12.62. Mean yield 12.4 x 125-lb. bags per acre (C.V. 21.6 per cent.). There were no significant differences, but 'Comet' gave the highest yield (15.1 bags) and 'Beacon' the lowest (9.5 bags).

SUNFLOWER SPACING x FERTILISER TRIAL.

Treatments: Inter-row 2 ft. 6 in. and 3 ft., intra-row 6 in. and 12 in.; fertilizer none and 400 lb. M (9:12:9) per acre; variety Short Russian. Planted 5.1.63. Mean yield 16.02 bags per acre (C.V. 7.7 per cent.). *Results:* No significant differences.

GROUNDNUT VARIETY TRIAL.

Details are for report by the Field Officer, Groundnut Research, Salisbury, for whom the trial was conducted at Gatooma. Twenty-five varieties were compared Planted 1.12.62. Mean yield 10.4 x 180-lb. bags kernels per acre (C.V. 11.7 per cent.). Highest yields ranged between 10 and 12.5 bags x 180-lb. kernels per acre compared with seven to nine bags in the previous season's trial. The four varieties Natal A3-1-2, Indian Bunch, both Natal Common types, and the two Valencia types, Kigang and Guayabita Bunch 1, are among the top yielders of the past two seasons.

MAIZE VARIETY TRIAL FOR MATOPOS STATION.

Twenty-five varieties. Planted 22.11.62. Mean yield 29.87 bags x 200 lb. grain per acre (C.V. 8.79 per cent.). Among the 12 highest yields, between which there were no significant differences, were seven Salisbury-bred varieties; three of these, namely SRH51, SRH 52, and 57H6, being the top yielders.

SORGHUM VARIETY TRIAL FOR MATOPOS STATION.

Twenty-four varieties. Planted 22.11.62. Mean yield 18.85 bags x 200 lb. grain per acre (C.V. 12.04 per cent.). The variety N.K. 300 was again the highest yielder (37.70 bags) for the third successive season at Gatooma. The three-year mean yield for this variety in trials at Gatooma is 38.95 bags per acre.

PUBLICATIONS

1. Gillham, F. E. M.—'A Study in the Response of Bollworm, *Heliothis Zea* (Boddie) to Different Genotypes in Upland Cotton'. This paper was submitted in the form of a thesis in part fulfilment of the requirements for a Ph.D. degree at North Carolina State College, United States of America.
2. Gillham, F. E. M.—'A Study in the Response of Bollworm, *Heliothis Zea* (Boddie) to Different Genotypes in Upland Cotton'. Proceedings Twenty-third Cotton Improvement Conference, National Cotton Council of America, January 1963.
3. Gillham, F. E. M.—'Resistance to Insect Pests in Upland Cotton'. Sixty-first Congress of the South African Association for the Advancement of Science, July 1963.
4. Gillham, F. E. M.—'Insect Resistance in Upland Cotton'. Central African Scientific and Medical Congress, August 1963.
5. Tunstall, J. P. and Matthews, G. A.—'Recent Advances in the Control of Cotton Insect Pests in the Rhodesias and Nyasaland'. Central African Scientific and Medical Congress, August 1963.
6. Tunstall, J. P. and Matthews, G. A.—'Cotton Insect Control Recommendations for 1963/64 in the Rhodesias and Nyasaland'. *Rhodesia Agricultural Journal*, Vol. 60, No. 5, September-October 1963.
7. Tunstall, J. P. and Matthews, G. A.—'The Safe Use of Insecticides for Cotton Insect Control in the Rhodesias and Nyasaland'. *Rhodesia Agricultural Journal*, Vol. 60, No. 5, September-October 1963.

GRASSLANDS RESEARCH STATION, MARANDELLAS

The Grasslands Research Station, near Marandellas, serves the agriculture of some 12,500,000 acres of sandy country in north-eastern Southern Rhodesia, where the rainfall is usually sufficient, and sufficiently reliable, for arable farming without irrigation.

Within its means, the Station deals with all aspects of the agriculture of its region except tobacco, and with this crop it works by offering its facilities and co-operation to the Tobacco Research Board of Rhodesia and Nyasaland.

As its main task the Station is seeking means of maintaining and raising soil productivity. It is believed that the sandy soils of the region, once brought into cultivation, can best be preserved for continuing agricultural use by some system of ley farming, and much of the work of the Station derives from this belief. Such a system, however, has little application in African agriculture at present, so other possible means of maintaining productivity are being studied as well.

Notable features of the past year have been the opening of the new laboratories of the Agricultural Research Council of Rhodesia and Nyasaland on the Station on 1st September 1963 and the opening of a Legume Inoculant Factory in October 1962.

WEATHER

Rain continued till mid-April and amounted to 47.90 in. for the year. The winter was sunny with cold nights and 49 frosts.

The early part of the summer was over-wet and cloudy so crops came away slowly and suffered severely in dry weather that followed in January. After that, however, all crops except groundnuts, which had failed to peg in the dry weather, recovered remarkably well. Irrigated winter crops did well and livestock flourished the year round.

EXPERIMENTAL WORK

LEGUMES

In view of the need to produce more protein-rich food for both man and beast, and in view of the potential importance of groundnuts and soya beans as cash crops, study of legumes is given first call on the Station's resources.

The collecting and testing of the legume bacteria, *Rhizobium*, was continued, with special attention to those of soya beans, groundnuts, lucerne and garden peas and beans; as a result well-tried strains are available for the first three legumes mentioned and promising ones for the last two.

Study of groundnuts was continued for the fifth season. It is clear that, of over 200 varieties tested during that time, the early-maturing varieties of the Valencia type are best suited to the district. It would seem that planting density should be of the order of 100,000 plants per acre—with fewer plants yield tends to be less, and with more the kernels tend to be smaller. There appears to be no practical need to inoculate with *Rhizobium*, the indigenous strains of which appear to be able to meet the needs of the crop. Responses to fertilizers have again been small.

Soya beans have been studied in a small way for a number of years, but this year a much stronger attack on the problems of growing them was made. From observation of a collection of some 240 varieties it seems that the earlier-maturing varieties are the better suited locally to seed production and the later-maturing varieties to fodder production; it would seem, too, that the culture of the two types for the two purposes will require separate study. The collection has been found to include a wide range of oil- and protein-contents and of susceptibility to attack by root-knot nematodes. Other findings from the season's work are that planting density should be of the order of 120,000 or more plants per acre, that early planting is important when seed is required but less so when the crop is to be taken as fodder, and that the need for fertilizers is small. The need for inoculation was taken for granted and not tested, but it is noteworthy that nine of the varieties grown were immune to the Stations 'best' strain of *Rhizobium*

In experiments in growing lucerne under irrigation the need for inoculation was clearly shown, and it was found, even with effectively nodulated lucerne, that marked improvements in growth and yield followed the use of compost and nitrogenous fertilizer. Even more remarkable was the finding that these two substances increased each others' effect when they were applied together—a similar effect was found with maize in another experiment.

The search for pasture legumes was continued and, from the first 100 under observation, nine have been selected for further study.

GRASSES

Grasses, as the basis of the Station's work with leys, continued to receive much attention.

The search for productive, leafy, free-seeding, nematode-resistant grasses that will withstand intense summer grazing was continued; certain species of *Paspalum* that were coming to the fore last year still show the most promise and it seems likely that these will be able to compete economically with the veld as summer grazing.

Studies of the culture of grass have shown, with Sabi Panicum, that pastures may be cleaned at the end of winter by burning, which is cheap, instead of mowing, which is expensive, without reducing the following season's growth, and that nitrogenous fertilizer is equally effective in promoting growth when applied either before or after the first rains.

Once again Sabi Panicum has given much greater yields when grown in 3-ft. rows than when grown in a close stand — but see the effect of this on subsequent maize yields as reported later under 'Soil Productivity'.

In an attempt to find clues to the cause of the immobilization of nitrogen under grass leys a stand of Sabi Panicum is being interfered with in various ways. The first finding is that root pruning, so far from increasing subsequent yield by releasing nitrogen, has drastically decreased it, even in the presence of large quantities of compost.

In a final test of varieties of oats grown under irrigation for soilage the Rhodesian-bred variety, S.15, appears to be the best.

MAIZE

In routine tests of maize-hybrids from the Salisbury Experiment Station the single-hybrid being sold commercially as 'No. 52' came second on the list with a yield of 37 bags per acre and, of those on the market, the double-hybrid being sold as 'S.R.13' came next with a yield of 31 bags per acre. Both hybrids were notably resistant to leaf blight.

LIVESTOCK

Experiments with livestock, of which there were 12, continued to be concerned mainly with the use of local feeds for beef cattle, dairy cattle and sheep.

Last year's finding that it is of advantage to add maize-meal when feeding protein-supplements to steers subsisting on coarse roughage in winter was confirmed in the case of groundnut-meal but not in the case of green oats.

Beef calves running with their dams on good veld grazing were found to gain very little from a protein-supplement given to them with the idea of securing more growth before weaning — in short, the veld was sufficient for their mothers and themselves.

Assessment of the carrying capacity of planted pastures showed, with Sabi Panicum, that an acre of planted pasture, fertilized with 80 lb. of nitrogen per acre, will produce enough silage and foggage in the summer to maintain three steers for the winter, from June to September inclusive.

With the Friesland dairy herd it was found that cows grazing on a Star Grass pasture, fertilized with 80 lb. of nitrogen per acre, gave as much milk when they were given 3 lb. of maize-meal (8 per cent. C.P.) per gallon of milk in excess of two gallons daily as they did when given the same quantity of meals containing twice and three times as much protein, and that they did so with no loss of weight. This finding supports the belief that the extra protein requirement of milking cows on pastures is less than is generally supposed and, if confirmed, will be of great help to the dairy industry.

For the fifth winter in succession Friesland heifers, grazing on maize stover and receiving 20 lb. of grass silage each daily, gained about 1 lb. per day from mid-July to mid-October. Beef steers of similar age did not do so well.

With sheep it has been found that six-weekly dosing with the new worm-remedy, thiabendazole, has given complete control of round worms — no eggs were found in the faeces at any time. This remedy, therefore, with the new grasses coming forward, bids fair to make intensive sheep production practicable in this country.

SOIL PRODUCTIVITY

Six long-term experiments with the effect of various practices on soil productivity were continued and two more were started.

In the Station's biggest experiment of this kind it was found that the yield of maize after a four-year Star Grass ley was greater than that after a two-year ley, and that it was greater where the ley had been heavily grazed than it was where it had been lightly grazed. And, as in earlier experiments, it was found that the residual effect, on the maize, of nitrogenous fertilizer applied to the ley was small and not at all of the same order as that of the direct effect of similar quantities applied to the maize itself.

Counts of parasitic nematodes showed that certain species thought to be harmful to maize increased in numbers as the ley just mentioned became older. After two years numbers were still not such as to have much effect on the yield of the subsequent crop of maize, but after four years, to judge from the effects of fumigation with ethylene dibromide, they had increased to the point that they were decreasing yield by 1½ bags per acre.

In an experiment in which Sabi Panicum had been cut as hay for four years it was found that the yield of the following test-crop of maize was lower where the grass had been grown in 3-ft. rows than it was where it had been grown as a close stand — the reverse of the effect on the yield of the grass itself. It was also found that the yield of maize was somewhat lower where the grass had been well fertilized with nitrogen than it was where it had been sparsely fertilized — again the reverse of the effect on the grass itself. There is, therefore, an indication that the removal of larger crops of grass may lead to smaller after-crops when the grass is ploughed, presumably because of the greater removal of something not taken into account so far.

VELD

Six experiments comprising studies of veld-management systems, effects of burning, effects of over-grazing, and methods of killing coppice have been continued. It becomes clearer that fire alone, once in four years, cannot control dense msasa/mnondo (*Brachystegia/Julbernardia*) coppice even when grazing is light but that it can control sparse coppice even when grazing is heavy. Slashing is found to be a useful adjunct to fire.

IRRIGATED AND VLEI LAND

Five experiments with tile-drainage of vlei land were started and/or continued in co-operation with the Department of Conservation and Extension. Work with irrigated oats and lucerne has been reported under 'Grasses' and 'Legumes'.

THE CHEMISTRY LABORATORY

Nearly 2,400 samples were analysed in the Chemistry Laboratory during the year, most of them being herbage samples analysed for their content of nitrogen.

Study of the starch content of trees was continued, and from it a report was made on the possibilities of establishing a starch and fibre extraction industry. A new quantitative method of determining starch was partly developed.

EXTENSION

VISITORS

About 1,150 visitors, including 200 African farmers and students, were recorded during the year.

A most successful open-day, the first since 1956, was held on 29th March, with some 250 visitors in attendance. In addition, 23 parties of visitors were shown round.

TALKS, LECTURES AND VISITS

Twenty talks and lectures were given in various parts of the country, 12 advisory visits were made, and nine judges were provided for agricultural shows and ploughing matches.

ISSUE OF SEEDS, ROOTS AND CULTURES

Some 170 samples of seed and 134 bags of grass roots were distributed locally and to 12 foreign countries, and 635 cultures of *Rhizobium* were provided for experimental purposes.

Production of legume inoculants was started in the new factory in October, using new methods of production developed on the Station. However, due presumably to the uncertainty of the times, demand for inoculant was small and only 4,073 were produced by the end of June — 2,996 for soya beans, 1,073 for lucerne and four for white clover.

PUBLICATIONS

Five papers and articles were published during the year.

DOMESTIC MATTERS

STAFF

Two changes of staff occurred during the year. Mr. J. L. Grant arrived on 1st January to fill the new post of Animal Husbandry Research Officer, and Mr. D. S. Trollip, Assistant Farm Superintendent, left on 31st July and had not been replaced by the end of the year.

Officers were on vacation leave for 804 days, sick leave for 102 days and occasional leave for 93 days.

A conference of agronomists, attended by 65 persons, was held on the Station on 20th and 21st March, and a conference of pasture research officers, attended by 20 persons, was held on 15th and 16th August. Eleven papers were read at the former conference and nine at the latter.

FARM CROPS AND LIVESTOCK

In the Station's arable rotation there were 340 acres of planted grassland, 78 acres of maize, 70 acres of compound allotments and 30 acres of fallow. In addition, there were 18 acres of irrigated pastures. Some 2,200 bags of maize cobs were reaped and 765 tons of maize, grass and soya bean silages and 50 tons of Sabi Panicum foggage hay were made.

The Station's livestock included 389 beef cattle, 89 dairy cattle and 184 sheep at the end of the year.

In the dairy herd the average output of milk from all 300-day lactations completed during the year was 10,447 lb., with an average butterfat content of 3.63 per cent.

In connexion with the experimental programme 265 cattle were bought and 100 sold on grazier agreements with the Cold Storage Commission.

Revenue from the sale of meat and milk amounted to £10,000 for the year ending on 30th June, with another £920 coming in from the sale of legume inoculants.

ESTATE

Fourteen semi-detached houses were built and 11 were renovated for members of the African staff and labour force, and one European house was built. Water from the Station's main boreholes was piped to the African residential areas and to the northern European residential area.

The irrigation mains were moved to a new site and 25 acres of land prepared for irrigation.

AFRICAN WELFARE

The Station's African school, overfull, had 150 pupils at the end of the year, 69 of them being boys and 81 girls, and the African Women's Club, with a membership of 15, continued to flourish.

ACKNOWLEDGEMENTS

Very generous gifts of fertilizers were received from Messrs. Fisons (Rhodesia) Ltd., Messrs. Windmill Fertilizers (Rhodesia) Ltd. and Messrs. African Explosives and Chemical Industries (Rhodesia) Ltd.

The Station's thanks are due to Canon S. M. Wood for supervising the African School and to Mrs. H. D. L. Corby and Mrs. D. A. Robertson for running the African Women's Club.

HENDERSON RESEARCH STATION

GENERAL

LOCALITY AND RAINFALL

The Station lies in the centre of the maize-growing area of Mashonaland and comprises in the main a variety of rich loam soils. A section of granite hills with sandy soils of various types at their base covers several hundred acres in the south-eastern section.

The rains were exceptionally heavy in the early half of the season, some 24 in. being recorded between the start of the rains in November and the end of the year. Thereafter rain was intermittent and satisfactory. The total rainfall for the season was 47.19 in., well above the 36-in. average.

STAFF

Throughout the year the staff was up to strength and all accommodation was occupied. One Clerical Officer, two Professional Officers (Crop and Fisheries) and one Technical Assistant lived off the Station.

Today the staff comprises 15 Professional Officers (including two Conservation Research Officers and one Group Conservation and Extension Officer), 15 Non-Professional Research Officers, three Clerical Officers, 15 graded African staff (including one African Meteorological Recorder), five teachers and one Clinic Nurse. Between 150 and 200 monthly paid African workers are housed on the Station.

FARM DEVELOPMENT

Road surfaces and drainage have been improved. A much-needed bridge was built over the Dassura River at the north-east end of the farm. The area under fish ponds has been extended by 12 acres. Three Burley tobacco barns, a tobacco-grading shed and fibre retting tanks were installed with heating arrangements. A bee house with workshop and lecture-room was built for 20 colonies of bees. Three boreholes were sunk and equipped, one delivering up to 1,500 gallons per hour to the main African village, and the other two to deliver water for retting and for supplementing irrigation water supplies in the dry season. A new agronomy block now provides lock-up storage space for the yellow maize-breeder's seeds and equipment and field offices for some of the agronomy staff.

IRRIGATION

Throughout 1963 winter water was abundant in the river on account of the exceptionally high precipitation in the 1962/63 summer. Attention is being centred on ways and means, other than a 150,000,000-gallon storage dam, for ensuring against shortage of irrigation water at the end of winters following normal or dry summers. Until this problem is solved, much-needed research on irrigated fruit, winter cash and other crops and on small-scale intensive vegetable/fruit/pig/poultry and fish units cannot be embarked on effectively. Only a limited programme is being undertaken with winter cereals, onions, cauliflower, peas, lucerne, potatoes and tobacco. Supplementary irrigation of early sowings of maize, tomatoes and cotton is also being done.

ACKNOWLEDGEMENTS

Once again Messrs. Rodia Fertilizers and Messrs. Fisons Fertilizers Ltd. made substantial and generous grants of fertilizers to this Station, very greatly helping the programme of work, especially that related to pasture development and use, and the nutrition of beef cattle, both of which need large areas of fertilized pastures and large numbers of cattle.

VISITORS AND ADVISORY VISITS

The Officer-in-Charge gave 22 addresses to farmer and other groups. Sixty-four parties varying in numbers from five to 270 visited the Station. In the autumn, three large field-days were held, one for European farmers, one for people in the industrial and commercial world and another for African farmers from the purchase areas. Courses organized by the Department of Conservation and Extension have been held on the Station in Burley tobacco, small-holdings, irrigation, bee-keeping and farm machinery.

With the approaching amalgamation of European and African agricultural research, it is anticipated that there will be a need for a guest house or rest huts or a hostel to accommodate visiting groups from distant localities.

GENERAL NOTES ON RESEARCH OBJECTIVES

The work has been concentrated on ways and means whereby profitable production can be increased within the country. The work in progress is showing that production costs per bag of maize can be reduced by the achievement of high yields per acre. These yields are made possible by the use of hybrid maize seed, good ploughing and cultivation and dressings of manure and fertilizers which ten years ago would have been regarded as uneconomic. Plant populations of 15,000 to 20,000 are giving yields between 25 and 45 bags to the acre.

Now that production from the 300-acre Intensive Farm Unit is well over 200 gallons of milk per day, costs per gallon have fallen, but not sufficiently.

Significant progress is being made in understanding certain phases of nutrition of beef cattle, particularly relating to the efficient use of protein. In the sphere of beef and milk production from dryland perennial grass and legume pastures, important discoveries are being made.

Good crops of Burley tobacco and of Kenaf fibre were obtained and much information has been collected on barn design and curing methods in the case of Burley, and on harvesting and retting in the case of fibres.

Excellent crops of maize, tomatoes, cotton, groundnuts, lucerne and soya beans were grown.

A renewed and determined attack is being made on some of the problems connected with land productivity in the tribal trust lands. A start has been made with the help of a grant from the Rockefeller Foundation, and in this first year of operation the results have shown up the magnitude and complexity of this land-use and development problem.

FISHERIES RESEARCH CENTRE

STAFF

Miss E. Holl, an honours graduate of Rhodes University, took the place of Mr. Cumming, who resigned in April. During the year all members of the staff were on periods of vacation leave. There have been no staff increases and the lack of a Technical Assistant to maintain routine services at the Centre is keenly felt. The co-operation and interest of private individuals, anglers and angling societies, officials of the Department of Agriculture (Southern Rhodesia), Conservation and Extension, Department of National Parks and other bodies has been of great value and is recorded with appreciation.

CONSTRUCTION WORK

A small shed for fish preparation and drying was started towards the end of the year. The collection system for returning seepage has been reorganized and facilities for measuring the flow of canalized seepage water returning to the river installed.

Enlarged trash grills, screens and screening boxes were installed in the main feeding furrow. During the year the originally projected pond scheme was completed by the construction of some 12 acres of new ponds consisting of ten ponds for production experiments, fry rearing and breeding. Special funds were made available for this work and covered also the cost of completing the main furrow and canalization system for new ponds. Weirs and flumes have been installed in the Dassura River and in furrows, enabling measurements to be made on complete water usage, river flow and part of seepage return. Final water rights in respect of the scheme have now been granted.

Protective fencing of the main pond site was almost fully completed by the end of the year.

The animal section was maintained and increased by the addition of a small flock of hens for use in conjunction with the experimental production unit.

Water supplies during the year gave no cause for anxiety. Use is now made of storage from the Savory Dam for supplying approximately six to ten acres when the river flow is insufficient.

Constant temperature recordings have been made in an acre pond using a distance thermograph. From May to September average maximum temperatures were below 20° C. while the average minimum was lowest in July at 12.98° C.

Despite closure to fishing during October 1962 and from July 1963, 2,209 anglers visited the Savory Dam during the year, taking a total of 2,209 lb. of tilapia, 271 lb. of barbel, 583 lb. of carp and 137 lb. of bass. Replanting of the dam wall to grass and other improvements and repairs were carried out on the dam during the year.

Tilapia, bass and small quantities of carp fry were distributed for stocking and experimental stocking.

EDUCATION AND PUBLICITY

During the course of the year, the Chief Fisheries Officer made widespread advisory and inspection visits to a large number of areas in the Colony. Addresses were given to angling societies, farmers' associations and intensive conservation area meetings. Demonstration and test fishing were carried out for small groups in many intensive conservation areas. A course of lectures and practical demonstrations was held during the year for Gwebi students. Specialist lectures and demonstrations were held for members of the Small-holders' Association in October. During April a course of fish farming was arranged by the Southern Rhodesia Department of Agriculture for Agricultural Officers. Lectures, demonstrations and practical instruction were given.

The Fisheries Research Centre assisted the Southern Rhodesia Department with a fish exhibit at the 1963 Salisbury Show and had its own exhibit in the Federal Ministry of Agriculture Hall. Fish exhibits at Marandellas and Bulawayo were set out by the Southern Rhodesia Department of Agriculture and drew much attention.

Close contact was maintained with angling societies, Conservation and Extension Department, educational and training institutions, town management boards and municipal bodies. The increasing number of dams being built in reserves and purchase areas has led to growing interest in the utilization of these waters for fish production. In general, management of dams of 10 to 20 acres in these areas is fairly simple and rod and line cropping of conservation dams at a relatively high intensity is the sole method of exploitation. Larger dams have the possibility of being developed along the lines of a small-scale industry with part-time fishermen using nets, traps and long lines.

A number of new pond culture enterprises were started during the year and it is gratifying to record that older-established units properly managed are functioning at a high level of efficiency. A number of field experiments on cropping and management have been started during the year, and so long as accurate records are obtained, these will be of great value in assessing types of management required. Interest in pond fish culture in certain reserves and native purchase areas is growing although, as yet, no large-scale developments have taken place in the building of small family ponds. Pond units operating as fry production and demonstration units are established in several areas and can be used for training of farmers and demonstrators.

Several groups of farmers have formed syndicates for the purchase of nets and for easing marketing problems which exist for those farmers with sporadic supplies.

VISITS, SURVEYS AND FIELD RESEARCH

The Chief Fisheries Officer spent ten days in Northern Rhodesia with officers of the Department of Game and Fisheries in June.

Work continued on lakes Ngesi, Sebakwe and McIlwaine during the year. Surveys were also carried out on Fern Valley Lake, in the Umtali area, for which a complete year's records have been obtained through the efforts and interest of members of the angling society.

TROUT

Fingerlings obtained in April were successfully reared to table-size trout by September. A working basis has been elaborated for commercial trout production in areas well supplied with water and of similar climate to the Fisheries Research Centre. Experimental stockings in Selukwe and Shangani have also been made. Satisfactory growth of 12 oz. to 1 lb. has been obtained in the waters at Selukwe by the Superintendent.

CARP PRODUCTION EXPERIMENTS

Low stocking rates of 450 fish per acre have been successful in giving three growth periods per year with individual fish of 1 to 2 lb. Experiments with higher stocking rates and cropping are not as yet complete. An investigation of growth of carp at different levels of nutrition has given preliminary results and will, if necessary, be repeated next year.

TILAPIA PRODUCTION

Production-scale experiments are in progress on tilapia/bass, tilapia/serranochromis combinations as opposed to pure tilapia production. Short-term experiments with bass and tilapia have been carried out to give indications of bass growth and predation. Feeding experiments with tilapia were also carried out during the year.

300-ACRE INTENSIVE FARM UNIT

On account of the wet conditions in December, crop yields were somewhat less than in previous years. Some 850 tons of silage and 900 bags of maize grain were reaped. The herd has improved and for the latter quarter of the year the milk yield was between 200 and 250 gallons per day. The year's milk sales exceeded 64,000 gallons. In this winter 800 tons of manure were returned to the land from the pens.

Production was improved by a change of rations. Through the winter each cow consumed 60 lb. of maize silage daily and a meal mixture comprising 2 lb. of bought compounded concentrate and 3 lb. corn, cob and sheath fed at the rate of 5 lb. per gallon produced.

Although the gross product for the year is some £10,000 worth, higher than ever before, and although costs per unit of product are being reduced each year, it is clear that the gross product can still be greatly increased, and the costs per unit of product can and must be further reduced. The gross product per man now stands at about £700 and it is clear that this can be raised without any great increase in capital involvement on the enterprise as a whole, to such a level as will permit of wage increases as a result of increased profit earning. This will entail further adjustments in the farming plan and layout of buildings. Improvements are needed in maize harvesting, storage, mixing and feeding, manure handling and better feeding and grazing régimes in the summer as well as winter. Research on the Station is opening the way towards these possibilities.

The co-operation and assistance rendered to the 300-acre unit by Mr. S. A. Cloete, chairman (Assistant Secretary, Economics and Markets, Federal Ministry of Agriculture), Messrs. E. McArthur and R. Calmeyer, farmer members, and Mrs. G. Kerr, accountant, are gratefully acknowledged.

PASTURE RESEARCH SECTION

Studies of forage sequences for beef breeding cows, weaners, steers and fattening cattle were continued. In one trial with breeding cows, vleis provided a valuable 52 grazing days per acre through spring between mid-July and early December. The cows were fed 5 lb. corn and cobmeal and 3 oz. urea daily and lost 40 lb. in weight after calving in October. As in the previous year this loss of weight did not prejudice conception rates, which were high. In addition to this valuable early grazing before the rains, the vleis gave a further 19 grazing days per acre in the autumn.

Subsequent summer grazing for 165 days from 4th December to 28th May was provided at the rate of approximately one cow per acre. The cows gained 120 lb. and the average weight of their calves, weaned at 6½ months, was 438 lb.

A maize test-crop, fertilised with 200 lb. superphosphate, 100 lb. muriate of potash and 400 lb. calcium ammonium nitrate and following sown pastures which had provided summer grazing for the cows for three years, yielded 23.72 bags of grain per acre.

Aberdeen Angus weaners which had been over-wintered on 20 lb. legume silage, 10 lb. corn and cobmeal and maize stover *ad lib.* each, were summer grazed on sown pastures to investigate the possibility of producing animals for slaughter at the age of 18 months. The average bodyweight of the 12-month-old animals on 4th December 1962, when winter feeding was completed, was 652 lb. At this time the animals were allocated on a bodyweight basis to a light or heavy herd and the herds, which averaged 593 lb. and 711 lb. respectively, grazed on common pasturage. Grazing on sown pastures took place between the 4th December 1962 and 28th May 1963, at a grazing pressure of 168 grazing days per acre and during this period the animals in the light herd received no additional feed whilst each animal in the heavy herd was given a supplement of 5 lb. corn and cobmeal daily.

At the end of the summer grazing period the average bodyweight of the light and heavy herds was 709 lb. and 871 lb. (at 18 months of age), representing average increases of 116 lb. and 160 lb. respectively. From these results it is clear that the relatively high level of nutrition which both herds received in winter, markedly reduced the efficiency of the summer grazing in producing animal gains, and these gains were only slightly improved by the addition of carbohydrate-rich feed. This work continues.

SUMMER MILK PRODUCTION

Studies of the seasonal production of milk continue with particular attention to the feeding of corn and cobmeal during the grazing season.

The general average milk production per cow over a 232-day lactation was 4,703 lb. and during this period an increase in the average bodyweight of the animals was recorded.

Results from feeding varying quantities of carbohydrate-rich supplement to cows grazing on sown pastures indicated that when the daily ration of corn and cobmeal was raised from 2.5 lb. to 5.0 lb. per head, milk production was increased by 625 lb. over a 182-day test period. When the daily ration was raised to 7.5 lb.

per head the increase in milk production over the same period was 797 lb. At both levels the supplement tended to become more effective as the grazing season progressed.

During the 201-day grazing season the herd was on vleis for 56 days and on sown pastures for 145 days. It is clear that the level of nutrition provided by this grazing, together with the corn and cobmeal supplement, was sufficient to support reasonable milk production and adequate bodyweight gains, and to ensure conception in 91.3 per cent. of the cows.

A daily individual ration of Rhodes Grass hay *ad lib,* 20 lb. legume silage and 5 lb. corn and cobmeal provided the dry cows with a satisfactory level of nutrition during winter.

LEGUMES

Work has been concentrated on perennial legume species and *Desmodium intortum* and *Desmodium discolor* continue to show promise. Both species were again successfully established in cover crops of maize.

Desmodium intortum which was grazed by dairy cows for two hours daily to supplement Giant Rhodes Grass pastures during the growing season, provided 238 supplementary grazing days per acre. In addition, it was necessary to impose 17.5 full-time grazing days per acre during January to control the growth. A first-year pasture which was grazed until mid-January and then closed for a silage cut, harvested in May, provided 8.19 tons of edible silage per acre. The herbage was reaped with a flail-type harvester and was readily consumed by all classes of cattle.

A yield of 21.4 bags per acre was obtained from a maize crop grown without nitrogen fertilizer on a land which had been down to *Desmodium intortum* for the two previous seasons. When 20 lb., 40 lb. and 80 lb. dressings of nitrogen were applied to the crop the yield was increased to 23.6, 28.0 and 32.9 bags per acre respectively.

Similar results have been recorded from trials in which *Desmodium discolor* was used to provide protein-rich autumn grazing and silage. The vigour of the plants is considerably reduced by taking more than one silage cut in addition to the autumn grazing in any one season. Current experiments show that this legume can be established in the veld and successfully compete with the native grasses to form a dense leguminous cover.

Where cattle had access to legume grazing in addition to Rhodes Grass grazing, faecal nitrogen data indicated that an intake of protein, similar to that obtainable from grass in early summer, was maintained throughout the late summer and autumn.

Work by Dr. Daulton of Kutsaga shows that *Desmodium intortum* is resistant to the common root-knot nematode *Meloidogyne javanica.* In the case of *D. discolor,* there seems to be some variability in the plants in that some plants are only mildly susceptible to the nematode, while others are subject to severe infestation.

Experiments designed to provide information on the optimum method of sowing grasses into established stands of pure legume have shown that where the legume is not checked, its vigorous growth completely suppresses the development of the grass seedlings. This excessive competition can be reduced by cutting or grazing the legume during the growing season and it is apparent that the defoliation can be timed to provide useful silage and autumn grazing.

Where grasses are sown into established legume stands, the contribution of nitrogen towards the growth of grass by the legume appears to be some 80 lb. per acre. These mixed pastures, fertilized with 200 lb. superphosphate, provided 136 grazing days per acre during the growing season.

GENERAL EXPERIMENTS

For the past four years, triple superphosphate has been used to supply the phosphate requirements of grass, legume and maize crops and there was no beneficial effect on any of the yields through the addition of gypsum.

Visual assessments of four-year-old Giant Rhodes Grass pastures have frequently indicated that nitrogen applications in excess of the usual amounts of 80 lb. per acre are required to provide growth similar to that yielded in the first season. In an experiment to ascertain the precise amount of nitrogen needed to maintain productivity, it was found that 280 lb. of nitrogen per acre was necessary.

Investigations on the effects of various stocking rates and burning frequencies on veld used for winter grazing continue. No major differences have been detected in dry matter or animal production between grazing pressures of 24, 36 and 48 grazing days per acre and there are no obvious differences between the burning treatments which are still in an early stage.

Preliminary results from an experiment comparing Giant Rhodes Grass and veld under various cutting frequencies and fertilizer levels show that while the dry matter production for both swards was increased by the addition of fertilizer, the response by veld was more pronounced. The highest yield of dry matter was obtained from veld under an infrequent cutting treatment.

SMALL-SCALE INTENSIVE FARMING ON GRANITE SANDS

This programme is designed to explore the problems of small-scale intensive farming on granite sands and to elaborate farming systems which are practical, economic and maintain the health of the soil. A headquarters for the project has been developed with office, workshop, feed and fertilizer stores, spray race and cattle pen. In addition, a supply of water has been established from a well equipped with pump, tank and troughs. Three systems of farming are under scrutiny.

Mixed Farm

The potential of a simple farming system similar to that recommended to African farmers in the Chinamora Reserve has been assessed for the second year. The farm is 80 acres in extent and comprises 20 acres of vlei, 20 acres of arable soil and 40 acres of steep granite-veld grazing. Both crop and livestock production are carried out and poultry, rabbits, a vegetable garden and a small orchard have been established for subsistence requirements.

The exceptionally heavy and continuous rains which fell during the growing season caused severe waterlogging throughout the cultivated area and resulted in poor crop yields despite liberal dressings of fertilizer. Two sections which were planted to maize produced 13.45 and 5.20 bags of grain per acre, whilst groundnuts and rupoko yielded 6.10 bags (unshelled) nuts and 2.95 bags of grain per acre respectively.

A half-acre of Turkish tobacco which was planted in the veld area failed due to infestation of eelworm and bushy top disease.

The full complement of livestock was introduced during the year and already it has become clear that if the existing numbers are to be retained, a radical change will be required in the present feed supply. Dry matter reserves from veld, vlei and crop residues are inadequate for the needs of two work oxen, three cows and 12 ewes. The amount of work for which the oxen were required was extremely limited and as a first measure of reducing the demand for dry matter, these were replaced by two donkeys. Further, it will be necessary to establish sown pastures to provide extra summer grazing to facilitate effective management against bush encroachment and sward deterioration of the veld.

The three cows, which all calved at various times, produced 637 gallons of milk during the year and the progeny of the ewes which lambed were sold as fat lambs after weaning.

A high mortality rate among the new-born rabbits considerably reduced the sales of this product which only amounted to 108 lb. during the year. In view of this the rabbits were discontinued and it is proposed to enlarge the more profitable flock of 15 hens which produced 156 dozen eggs after coming into lay in January.

Experience has shown that planting and cultivating operations in the light, sandy soils can be efficiently performed with simple, push-type hand implements. Apart from the benefits derived from sowing correct seeding rates and uniformly spaced, straight rows, performance of the operations is less dependent on weather conditions than the heavier ox- or tractor-drawn implements.

An analysis of the labour allocated to the various activities on the farm indicates that the amount of time devoted to watering, feeding, milking and herding of the animals is relatively high. Since this allocation represents the minimum labour requirement for livestock maintenance, production must be materially increased if the labour is to be profitably employed.

A small pond in which the farmer can raise fish has been constructed in a wet area of the vlei and this project is to be coupled with duck and pig rearing for subsistence needs.

The timber requirement for fencing and building will eventually be available from a half-acre eucalypt plantation which has been established on waste land. The value of the gross product from this farm was extremely disappointing, but the work is showing something of the size and complexity of the problems to be solved.

ANIMAL FARM

An area of 68 acres has been developed with fencing, water, roads, buildings, etc., to provide seasonally milked dairy cows with a high plane of nutrition. Twenty acres of riverine vlei were stumped, ploughed and levelled for planting with improved permanent pasture plants.

Sixteen acres of perennial legumes and grasses which will be used in a ley rotation have been established and a further 12 acres of land have been prepared for fodder crop production.

Twenty acres of veld grazing is being improved by the removal of excess woody vegetation and the hedgerow sowing of perennial legumes into the native grasses.

The animals for the farm will be drawn from the seasonally milked herd on the Pasture section and 20 dairy cows are to be introduced in the course of the coming season.

CROP FARM

An area of 12 acres is being developed to assess the potential of a farming system designed for maximum crop production. Preparation of this site has necessitated the stumping and removal of a 14-acre eucalypt plantation and this work, together with relevant ploughing, levelling and erosion control measures, has been completed.

During the coming season an eight-year rotation which includes grain, fibre, legume and tobacco crops, together with seed-producing leys, will be initiated.

The Standing Committee to advise on these investigations into small-scale intensive farming held regular meetings throughout the year.

The co-operation and assistance rendered to the Small Scale Intensive Farming Project by Messrs. S. A. Cloete, L. Uribe, A. V. Oates, Dr. C. Rose and Messrs. A. Jacha and Z. G. Ngalane is gratefully acknowledged.

ANIMAL HUSBANDRY SECTION

Investigations have continued into nutritional factors which affect the fertility of beef cows grazing on the veld. Results so far have shown unsatisfactory reproductive performance is closely related to poor body condition of cows during the mating period. The main nutritional deficiency is one of protein during the winter months. Feeding additional protein to pregnant animals increases their live weight and subsequently greatly improves their fertility while lactating.

It is possible that under veld grazing conditions certain breeds of cattle may be more fertile than others. Current research has been planned to investigate this possibility using cows of Africander and Mashona breeds.

Feeding additional protein to cows and to young cattle during winter has been shown markedly to improve their productivity. These protein-rich supplements are expensive and the economic advantage to be gained from this practice depends very largely on their efficient use. Accordingly a great deal of research effort has been directed towards determining minimal protein requirements of both cattle and sheep and investigating in some detail the factors which affect the efficiency of protein use by ruminants.

Natural veld grazing is the main source of food for ruminants in this country. Seasonal changes in chemical composition and nutritive value largely determine the productivity of animals grazing this pasture. Little is known of the amount and type of grass eaten by grazing cattle and there is no knowledge of how seasonal changes in the diet affect rumen physiology. A study is in progress to obtain information on this latter aspect of the problem. Members of the staff of the Department of Agriculture, University College of Rhodesia and Nyasaland, a biochemist from the Agricultural Research Council and officers at Henderson are collaborating in a detailed investigation. Africander and Mashona steers, each fitted with a rumen cannula, are being used and the rumen contents of these animals are sampled at regular intervals throughout the year.

AGRONOMY SECTION

Research was expanded into the fields of fibre research, Burley tobacco and yellow maize breeding. A Fibre Officer, a Maize Breeder and two Technical Officers were appointed for this work.

In spite of the excessive rains during December 1962 and February 1963, in general, good results were obtained. During the 1963 winter, pea and early planted wheat and barley experiments suffered severe frost damage.

DRYLAND CROPS

The groundnut variety Makulu Red produced yields of up to 3,056 lb. shelled kernels per acre when planted early. Supplementary irrigated cotton yielded over 2,200 lb. seed-cotton per acre but showed only slight responses to nitrogen and phosphate levels and within-the-row spacing. May frosts reduced the yields. Lucerne which was irrigated frequently throughout the year produced 11.2 tons dry matter per acre. The soya bean variety Hernon 135 gave the highest yield (9.3 bags per acre) while Hernon 147, Arcadian, Blyvoor and Hernon 107 showed promise. Soya beans inoculated with Grasslands inoculant produced 9.7 bags while those not inoculated produced 8.0 bags per acre.

An unnamed white-seeded commercial variety of sunflower produced 2,079 lb. seed per acre which was 284 lb. per acre better than the next best, Black Russian Short variety. Satisfactory results were obtained in experiments with maize and potatoes.

VEGETABLES

The season under review was only partly successful. The tomato fertilizer experiment was very successful in spite of extremely wet conditions during December when the crop was maturing. The highest yield was nearly 45 tons of fruit per acre (89,619 lb.) and was obtained from the highest application of phosphate (240 lb P_20_5 per acre).

The cauliflower fertilizer experiment and four major pea experiments, planted on the same contour were very badly affected by some, as yet undetected, detrimental soil condition. A bean fertilizer experiment, planted on the same contour, was badly affected by anthracnose, although the same seed used last year did not show any signs of this disease. The yields, though reduced by disease, showed similar trends in response to fertilizer and spacing as in previous seasons. In the bean variety experiment the variety Imuna outyielded all other 13 varieties (2,102 lb. seed per acre).

Heavy and persistent frosts caused considerable damage to all pea experiments.

The onion experiments so far do not show excessive bolting and should produce useful results. In the 1962 season onions responded well to differing nitrogen levels and water régimes. For example, 0, 40 and 80 lb. nitrogen produced yields above 16,500, 25,500 and 32,000 lb. medium-sized bulbs per acre respectively. 18.5 inches of water applied produced 16,500 lb. while 24.5 inches produced 26,000 lb. of medium-sized bulbs per acre.

Fibre research was started in September 1962. The plantings of *Phormium tenax* and Sisal, which are long-term crops, will only show results after some years.

In Kenaf research priority was given to selection of suitable varieties. A small experimental retting plant was installed to deal with a few acres of Kenaf grown for sale. The high yield of fibre produced per acre in what must be regarded as a difficult season indicates that, provided retting problems and costs can be ironed out, the crop has possibilities.

Yellow maize breeding started in October 1962 under direction and guidance from the Salisbury Experiment Station. Breeding material had been assembled from Natal, South America, Matopos Research Station and local sources, and the programme made a good start during the 1962/63 season. Selections were made in the best varieties and the best 50 Natal 53 inbreds were topcrossed for testing in 1963/64.

Part of the programme has been directed towards recovering yellow equivalents of the better white inbreds by outcrossing the white inbreds to a number of different yellow sources and then backcrossing to the white parent, retaining the yellow characteristic after each cross. Further backcrossing has been successfully carried out at the Sabi Valley Experimental Station during winter of 1963 in an attempt to speed up this breeding programme.

Apart from the fact that the combining ability of the backcrossed inbreds might be altered, there is the problem of the decrease in the yellow colour intensity of the kernel with the increase in the number of backcross generations. How serious this colour dilution is, will only be known after the first yellow hybrids from these inbreds have been grown.

The Burley tobacco programme was initiated in August 1962 under the direction of the Tobacco Research Board, in co-operation with the Department of Conservation and Extension. In spite of difficulties in land preparation, insect control and building construction, a great deal of information on seed-bed, field, barn and grading management was obtained. The spacing and topping experiment had to be abandoned due to leaf miner (tuber moth in potatoes) damage. The bulk crop produced 1,520 lb. leaf per acre which sold at an average of just over 33 pence per pound.

The research by officers of the Department of Conservation and Extension on erosion control on various soil types continued and is reported in an appropriate section.

It is appropriate to record the generous and ready help given to this Station by colleagues in other Departments and Branches, particularly in Finance, Conservation and Extension, Meteorology, Veterinary Research, Dairy, Chemistry, Botany, Seed Services, Public Relations and the Natural Resources Board.

MATOPOS RESEARCH STATION

(INCLUDING NYAMANDHLOVU AND TULI STATIONS)

ANIMAL HUSBANDRY

Studies are continuing to determine to what extent beef production can be increased through practising different systems of selection on varying planes of nutrition.

The following diagram illustrates the plan of investigation.

I

Pedigree Africander Herd

The bulls being used are selected on the standards of breed perfection independent of the environment in which they developed.

II

Grade Africander Herd

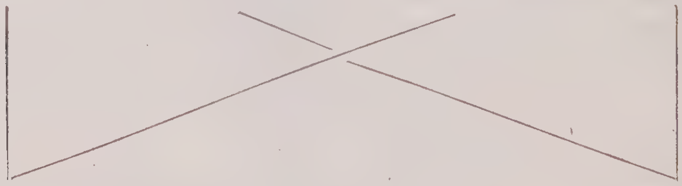
The bulls being used are home bred and selected on the performance of their progeny.

I *Feeders*

II *Non-Feeders*

III *Feeders*

IV *Non-Feeders*



1. The breeding season is so regulated to allow cows to calve down September to October.
2. Heifers are bred at the age of 2½ to 3 years.
3. Male progeny slaughtered at the age of 2½ years after a fattening period on a high protein concentrate ration.
4. Carcass and slaughter data taken.

5. Winter feeding of all stock on home-grown roughages is at a maintenance level.
6. Bulls are interchanged between pedigree groups.

1. Cows are being bred to calve down December to March.
2. Heifers bred at the age of 3 to 3½ years.
3. Male progeny slaughtered off the veld at 4½ years.
4. Carcass and slaughter data taken.

The intensity of selection is kept constant relative to the average performance of each herd. The two grade Africander groups are each divided into four subgroups and bred to different bulls which are progeny tested and compared.

The average weaning weights taken over three years of the progeny of four bulls bred alternately to supplemented and unsupplemented cows provide an indication of the relative breeding performance of each bull when bred to cows under different planes of nutrition.

	No. of Bull			
	2	9	11	6
Bred to unsupplemented Cows				
Average weaning weights of calves (lb.)	332	345	337	328
Bred to supplemented Cows				
Average weaning weights of calves (lb.)	388	427	408	391

From these observations it would appear that under both sets of conditions, the calves heaviest at weaning were the progeny of the same bull.

A comparison between the percentage weight loss experienced by grade and pedigree Africander cows on low and high planes of nutrition from January to November when the lowest weights were reached, indicates a weight advantage in favour of the pedigree Africanders.

	Percentage Weight Loss		*Calving percentage*	
	Fed	*Unfed*	*Fed*	*Unfed*
Grade Africander Cows	−0.7	−15.9	79.8	64.0
Pedigree Africander Cows	0.0	−11.2	70.4	51.8

Due to a lower calving percentage, the pedigree Africander cows were, in the fed and unfed groups, under a 9.4 and 12.2 per cent. less stress than the grade Africanders. This resulted in a weight advantage in favour of the pedigree animals.

From these differences between sires and the calving percentages between dams, it is clear that, independent of the system of management, beef production can be increased through practising more effective systems of selection.

PHYSIOLOGICAL STUDIES

At the end of 1963 summer period, the Hereford (H) Native (N), Native x Hereford dam and Hereford x Native dam steers that were maintained the previous winter were transferred to feeding pens to be fattened on a 12 per cent. DP concentrated ration with maize silage and milled-bean hay as roughages.

The following table provides a summary of the slaughter, carcass and feeding data obtained.

Group	*H*	*N*	*H x N*	*No* x H...
Average live weight (lb.)	981	968	1.056	1,060
Hot carcass weight (lb.)	544	537	588	581
Cold dressed weight (lb.)	528	521.3	570	564
Dressing	55.45	55.48	55.68	54.81
Average carcass measurements				
Length buttock (cms.)	74.9	79.7	79.4	80.0
Length carcass (cms.)	121.5	119.6	122.5	122.7
Depth carcass (cms.)	60.50	62.7	63.4	66.9
Length eye muscle (cms.)	12.8	13.8	13.5	13.1
Width eye muscle (cms.)	5.9	6.2	6.2	6.0
Gain per day (lb.)	2.45	1.99	2.41	2.50

FERTILITY TRIALS

Studies are directed towards a comparison between the value of vegetable proteins and urea fed in combination with certain trace elements, as maintenance supplements and their influence on the calving percentage and regularity of reproduction.

MUTTON PRODUCTION

The performance of the progeny of smooth-coated animals selected from Blackhead Persian x Dorset Horn crosses proved to a certain extent to be disappointing, and it is feared that a positive correlation way exists between coat cover and body conformation. It has been decided to establish a breed with good mutton qualities before selection towards a smooth-coated animal is undertaken.

To produce a fat lamb of approximately 65.75 lb. liveweight 130 to 140 days after lambing, it is obvious that feeding of the ewe at least six weeks before lambing down until two weeks after the first good rains is of paramount importance.

As part of an extensive study to determine the effect of different planes of nutrition to which ewes are subjected during winter periods in their lifetime production, one phase was directed towards the problem of how seriously maintenance and sub-maintenance feed levels would affect the reproduction processes of the ewe and body formation of the lamb.

These trials will continue, and data on the first phase are available.

The following table provides a summary of preliminary results of ewes that received no supplementary feed and ewes that were fed six weeks before they were due to lamb down until two weeks after the first good rains.

	Non-Feeders	*Feeders*
No. of observations	39	40
% ewes lambed	82.5	92.5
% lambs weaned	84.8	94.6
Birth weight (males)	6.67	7.96
Weaning weight, 20 weeks	55.45	61.48

Cotton-seed cake-meal was the only supplement used.

It is feared that the long dry spell in January might have affected the weaning weights adversely.

INTERNAL PARASITE CONTROL

Thirty-three weaner lambs were divided into the following three comparable groups, according to weight and age.

1. Control.
2. Dosed with Phenothiazine.
3. Dosed with Thibenzole.

To determine the worm burden carried by each group, worm egg counts were carried out in faeces samples collected at 14-day intervals, and during the second half of the programme at 21-day intervals.

The following table gives an indication of the differences in liveweight and the variation in the egg counts per gram faeces of the three treatment groups.

Group	*Control*		*Phenothiazine*		*Thibenzole*		
Month	*Live Weight (lb.)*	*Eggs/ Gram*	*Live Weight (lb.)*	*Eggs/ Gram*	*Live Weight (lb.)*	*Eggs/ Gram*	
30. 7.62	78	—	78	—	78	—	All Groups dosed
24. 9.62	85	32.25	88	0	88	24.25	Dosed 17.9.62
8.10.62	87	828.75	87	32.50	88	186.75	
23.10.62	89	2,925.00	89	30.06	89	72.25	
6.11.62	92	2,201.50	92	585.00	92	1,076.50	Dosed 6.11.62
20.11.62	89	2,386.25	90	162.33	89	0	
4.12.62	90	1,543.75	93	168.50	92	0	
18.12.62	93	1,974.75	96	398.50	94	227.75	Dosed 18.12.62
31.12.62	95	2,871.00	98	251.75	97	154.75	
15. 1.63	96	2,519.25	99	734.50	99	374.25	
28. 1,63	97	5,891.00	101	2,015.00	102	1,633.50	Dosed 28.1.63
18. 2.63	95	5,891.00	99	2,015.00	99	1,633.50	
12. 3.63	93	2,470.00	98	284.00	100	1.113.00	Dosed 12.3.63
1. 4.63	94	1,446.00	100	98.00	99	146.00	
15. 4.63	94	—	101	—	101	—	Dosed 15.4.63
8. 5.63	93	918.00	102	32.50	101	8.00	
28. 5.63	93	1,253.00	103	16.50	102	41.00	Dosed 28.5.63
19. 6.63	95	349.75	103	0	103	0	
10. 7.63	95	951.25	102	24.75	101	8.25	Dosed 10.7.63
31. 7.63	94	601.25	101	16.50	101	0	
21. 8.63	96	340.75	105	0	105	0	Dosed 21.8.63

From these observations it is quite obvious that a dosing programme must be included in the general management of the flock. During summer the dosing intervals should be at least once a month and during winter, once in six to eight weeks.

FIELD HUSBANDRY

DRYLAND AGRONOMY

Rainfall for the season was above average in the early part, but below average in January and February. There was very little rain in March but a hailstorm in April caused severe lodging and damage at Matopos.

The maize grain variety trials again demonstrated the higher-yield potential of the quicker-maturing hybrids from South Africa under Matabeleland conditions. The fertilizer trials at Nyamandhlovu and Matopos gave significant responses to both nitrogen and phosphate. Although the higher populations gave increased yields of two bags/acre at Matopos the difference was not significant. A trial to compare the effect of various insecticide treatments to control maize streak at Umgusa showed that the use of systemic insecticide at planting and spraying to control streak vectors both showed promise as control measures.

The Sorghum grain variety trials were arranged on a plant-height basis to reduce variation due to random height arrangement and possible bias due to exposure. NK 300 and NK 320 were again the two outstanding hybrids and remain at present the only two recommended for general use. Fromida has now been proved to give the best yield of the open-pollinated varieties that qualify for 'S' grade. Sorghum spacing/seed-rate trials gave inconclusive results. From records taken during plant growth and at harvest, information is now available about the factors contributing to yield.

Trials on cash crops other than the two main crops gave useful information on the possibilities of these crops for the areas served by the Station. With sunflowers, groundnuts and soya bean, the quicker maturing varieties all gave the best yields. The sunflower trial confirmed that the optimum spacing is between twenty and thirty thousand plants per acre.

The production of fodder in Matabeleland is an important part of the programme. In the maize silage variety/time of cutting and spacing trial the late maturing variety and the late time of cutting (29 days after 50 per cent. tassel) gave the highest yield. Yields from the sorghum silage trials exceeded 25 tons/acre and in the variety trial on heavy soil sorghum significantly outyielded maize or millet. Millet silage fertilizer trials on sandveld gave very large responses to nitrogen and phosphate and also the interaction was very highly significant. The following table gives details of the nitrogen/phosphate interaction table (yields in tons/acre at 20 per cent. DM).

	Nil	*40 lb. P_2O_5/acre*	*80 lb. P_2O_5/acre*
Nil	11.82	16.35	15.25
50 lb. nitrogen/acre .	17.99	27.04	30.30
100 lb. nitrogen/acre	18.45	33.08	33.13

IRRIGATION AGRONOMY

Results from the potato seed-size and seed-rate trial gave no difference in the total yield or yield of table potatoes between 10, 15 or 20 bags/acre of seed planted. With five bags/acre there was a significant reduction in the total yield and yield of seed potatoes. The smaller size of seed potatoes gave a significant increase in the total yield and the yield of seed potatoes.

The lucerne moisture-use trial was terminated in May 1963 after running for 14 months. During this period a large number of records were taken on plant growth and soil moisture. This data is being analysed with the assistance of the Biometric Unit of the Agricultural Research Council. The drier treatments in this trial showed considerable moisture stress during August-October but recovered well during the rains.

PLANT BREEDING

The first two synthetic varieties of maize from the programme started in 1957 are now available for testing in variety trials and the potential of the method can be assessed at the end of the 1963/64 season. The top-cross developed on Matopos has been produced on a commercial scale and is available for the 1963/64 planting season. Because NPP x K64r from South Africa has been a consistent yielder in the variety trials it has been decided to cross K64r with Potchefstroom Pearl grown in the Redbank area for a number of years.

With the introduction of a scheme for the production of certified sorghum seed, this Station is responsible for the production of breeders' seed.

CROP ECOLOGY

Growth analysis studies were done on cotton and sunflower in the summer and wheat in the winter. The cotton and wheat were part of the programme organized by the Sabi Valley Experiment Station. The cotton studies gave a very clear indication that only in very favourable seasons is cotton likely to prove an economic crop under dryland conditions in Matabeleland. The growth of the wheat was retarded by the very severe winter experienced at Matopos.

Work was again carried out on moisture use by crops on various soil types. A range of four crops were treated on sandveld and clay. Owing to the excessive rain in the early part of the season no differences were obtained on sandveld where waterlogging was present.

EXPERIMENTAL TECHNIQUES

A trial to investigate the effect of growing a tall variety alongside a short variety was carried out. For maize SR Hybrid 13 was used as the tall variety and AWF x K64r as the short variety. For sorghum NK 300 was the tall variety and Feterita 11/56 was the short. The effect was with both crops that the tall variety gave an increased yield when alongside a short variety and the short variety was depressed in the presence of a tall variiety. The following table gives a summary of the results and shows that the effect extends beyond the outside rows into the inside rows of a four-row plot (differences are in bags/acre at 12½ per cent. moisture).

	Maize	*Sorghum planted 1-12-62*	*Sorghum planted 21-12-62*
Short variety-tall variety . .	−0.13	−6.86	−2.76
Short variety flanked by tall minus tall flanked by short (outside rows)	−5.75	−29.15	−16.66
Short variety flanked by tall minus tall flanked by short (inside rows) .	−1.70	−13.89	−5.04

PASTURE RESEARCH

A. *Matopos*

The main emphasis during the year has been on collection of botanical data from the veld management and ecological trials, and the compilation and statistical analysis of these with a view to publishing results of all the veld investigated work.

VELD MANAGEMENT

The 1962 dry season was a difficult one, and before the rains broke it was necessary to give cattle running in the four paddocks (three herds trials on both sandveld and thornveld) supplementary protein in the paddocks. This was because of the extreme poverty of animals at the heavier stocking rates. Supplementary feeding has also been necessary during the current dry season on thornveld but sandveld cattle are wintering comparatively well.

For some years it has been apparent that steers do best when run at a light summer stocking rate and farmers are being advised to stock lightly during the growing season in order to reap maximum benefit. Although this trend appears in nearly all trials, statistically significant differences have only been obtained in one (four paddocks one herd on thornveld, a trial which has now run for 13 years).

The stocking rate trials again proved interesting, and on thornveld very obvious deterioration of the pasture is to be seen where cattle have been run for nearly five years at stocking rates of 1 : 7½ and 1 : 6. Deterioration is also taking place in the paddocks stocked at 1 : 9 but is less obvious. The current stocking rate for Matopos thornveld, if stability is to be achieved, is in the neighbourhood of one mature steer to 12 or 13 acres. On sandveld, on the other hand, in a trial that has been running for ten years, stocking rates as high as 1 : 5¼ have not, as yet, produced major changes in species composition although deterioration of the pasture is indicated by a marked loss of vigour of all species. In these heavily stocked paddocks there are also signs of sheet erosion (indicated by deposits of soil on the surface) but no measurements to prove this have been made.

In none of the stocking rate trials so far conducted has the return of beef *per acre* been least at heavy stocking rates although these treatments have consistently produced the smallest carcasses and the poorest grades. The 'beef per acre' return is masked, however, by the fact that the experimental animals receive supplementary protein when they have lost 15 per cent. of their peak body weight in the case of 2½-year-old, and 20 per cent. in the case of 3½-year-old animals. Were this not the practice, mortality would certainly have occurred in some years where grazing pressures exceeded one steer per eight acres.

PLANT SUCCESSION

All the seasonal grazing and isolation transect experiments were point-quadrated, charted and bush-counted during the year. Results of basal cover measurements show that effects of treatments are in close agreement with visual observations that have been made in the past. In the isolation transect on thornveld perennial basal cover was reduced from 4 per cent. to ½ per cent. by heavy grazing, as measured by charting, and the cover after 15 years' protection was 6 per cent. (higher than expected). The cover as measured by point-quadrat methods was more variable and tended to be higher than the corresponding charting figures, though the same trends in response to grazing were apparent. The results of charting the isolation transect on sandveld are incomplete but the point-quadrat analysis indicates that cover was much less affected by grazing than on the thornveld, and was, in fact, actually increased due to the dominance of *Digitaria pentzii.*

An interesting point that has emerged from the bush-counts is that although trees (mainly *Acacia* spp.) in the thornveld grow faster where heavy grazing is carried out (because of reduced competition from the grass), a greater total number and greater number of species occur in plots that are completely protected. This confirms the view that sound grazing management alone is insufficient to control encroachment — active steps to combat bush must be taken. A similar state of affairs exists in sandveld but there the main encroacher—*Terminalia sericea*—has been kept under control in the grazed plots by browsing.

Point-quadrat analyses of the seasonal grazing trials are complete, but the charting data have been analysed for the thornveld trial only, although the charts for the sandveld trial have been made. Basal cover for the two trials is summarized below.

Treatment	Thornveld *Chart*	 *Point-quadrat*	*Sandveld* *Point-quadrat*
Complete protection . . .	1.82	2.50	2.75
Graze first half growing season	5.35	7.35	5.50
Graze second half growing season	3.21	5.80	8.15
Graze dry season and first half growing season	2.38	3.10	7.95
Graze whole growing season .	0.93	2.00	7.35
Graze whole dry season . .	4.82	3.60	5.30

In all these trials the response of species to treatments has still to be calculated and so have the results of bush-counts.

It should be noted that the chart and point-quadrat figures cannot be compared as only perennials were charted, whereas in the point-quadratting both annuals and perennials were recorded when hit. Also, charts were spread over entire plots whereas the point data were obtained from small fixed quadrats within the plots.

BUSH CONTROL

All the burning experiments have been re-analysed and bush-counted during the year. The data show that annual or biannual burning on ungrazed plots effectively reduces bush populations and prevents encroachment *for a few years* but that grass cover is seriously damaged by this too-frequent firing, and erosion and bush encroachment then takes place. Time of burning is also important, and grass cover is more seriously damaged by early burning than late burning. Bush can, however, be effectively controlled without damage to grass by burning just before the rains set in, at intervals of three or four years. In these experiments the highest percentage basal cover was measured in plots that are mown annually. Point-quadrat data obtained from a burning trial on red soils are presented in the following table to illustrate the point.

Treatment	*% Basal Cover Range* *1949*	 *1963*	*Remarks*
Annual burns . . .	2.67-4.87	207-3.10	Mainly annuals
Biannual burns . .	3.27	3.37-3.93	Mainly perennials/ annuals
Triennial burns . .	3.40-5.27	4.40-4.90	Mainly perennials
Annual mowing . .	4.60-6.07	6.03-6.93	Mainly perennials
Complete protection .	3.67	2.97	Mainly perennials and annual weeds Much dead grass

Note.—The trial has been in progress since 1948.

Judicious veld burning remains the main recommendation for controlling bush in Matabeleland but, as indicated above, great damage can be done to the grass cover, and bush encroachment can be encouraged if fire is used at the wrong time of the year or too frequently.

No new chemical or ring-barking trials were carried out during the year but both methods are worth consideration on susceptible species. Hand weeding has been shown to be a practical proposition when labour is used during slack periods but the areas that can be managed are limited in size.

The use of goats, especially if coupled with fire, continues to show great promise for the control of *Acacia* spp.

VELD FERTILIZER EXPERIMENTS

The three long-term experiments were harvested in January and February. This year the harvesting was done by hand, species by species, which has resulted in a good measure of the species contribution and composition after nine years of fertilizer application. Total dry matter yields and crude protein contents (all species) were as follows:

		lb. nitrogenous fertilizer per acre. 0	 300	 600	 900	 1,200
Black soil	lb. D.M.	2,260	3,470	3,760	4,050	3,580
	C.P. %	6.3	7.4	11.3	12.2	13.4
Sandveld	lb. D.M.	1,560	2,200	3.340	4,190	4,460
	C.P. %	6.3	6.8	14.2	16.2	16.7
Thornveld	lb. D.M.	1,960	3,540	3,820	4,430	3,330
	C.P. %	5.3	8.1	12.4	13.7	15.9

D.M. = Dry matter.
C.P. = Crude Protein.

IRRIGATION WORK

No experiments under irrigation were conducted during the year. Just over 7½ tons of lucerne hay were produced from 0.86 acres, the greatest yield per bed being 9.7 tons per acre. A total of 42.2 bags of maize was produced from 0·86 acres, equivalent to 48.6 bags per acre, with the greatest yield per bed being 56.5 bags per acre.

B. *Nyamandhlovu*

WEATHER

The growing season was good, with a total rainfall at the office of 22 in. The distribution closely followed the average for the period November to March. The Chesa gauge, three miles from the office, recorded 32 in., the difference accumulating over six months.

VELD EXPERIMENTS

During the year a detailed review of the older veld experiments was started and to this end some current trials were concluded.

STOCKING RATE TRIALS

The differences between the gains of animals in the stocking rate trials were less marked this year and the usual trend was hardly noticeable in one instance. This was due to:

(a) The good early rains (10 in. in December) and late start to grazing after the rest and burn year. This enabled the heaviest-stocked camps with a cover now of only annual grasses to produce so much growth that the true potential of the cover only became apparent during the dry season.

(b) The high incidence of ephemeral fever during the summer. All animals on the red loam lost weight for a period during January and February.

ECOLOGICAL TRIALS

There have been 15 annual burns, eight every two years, five every three years and three every five years, in the trial testing burning and mowing without grazing on red loam. Though the area was originally covered with *Themeda triandra* and *Heteropogon contortus,* only a little remains of this cover on the annual burns before any rain in October. 'Erosion' of the cover is also beginning on burns every two years but not on those every three years. Mowing every year in summer has maintained the perennial cover but burning every five years reduces the vigour of the grasses due to accumulation of old material between the burns.

The first of a series of experiments to measure the competitive effect of woody growth on the grass cover was laid out in dense *Terminalia sericea* woodland during the year. The first results will become available during 1964.

CHEMICAL BUSH CONTROL

The staff are co-operating with a local chemical firm and a nearby farmer on a herbicide screening trial for *Dichapetalum cymosum (Umkausaan).* The first treatments were applied in October 1962.

Further work is being carried out on the problem species, *Acacia nilotica, Dichrostachys cinerea* and *Acacia nigrescens,* which form thickets on the red loam soils. Following the success of stump treatments using light diesel fuel and 245T in light diesel fuel, basal stem sprays in October and January have been tried.

RINGBARKING

Ringbarking has now been tried out on all the species on the red and black soils and a start made on those occurring on the sandy soils. It is still too early to tell which species are most affected, as the oldest treatments are only two years old. Cheap hand axes are used and the work carried out during summer months when the bark of most species comes away cleanly.

CROP EXPERIMENTS

Five crop experiments were conducted for Field Husbandry, Matopos. They concerned maize for grain on the sand soils and sorghums for grain and forage on the black basalt.

A Turkish tobacco (Solouk) trial was carried out for the Tobacco Research Board. It compared single rows on small ridges and on the flat with double rows planted in a similar manner and, despite the site being generally too fertile, the leaf realized excellent prices.

PASTURE EXPERIMENTS

Recent experiments showed that the natural *Cynodon dactylon* (Couch) and *Digitaria pentzii* (Finger Grass) cover on arable lands left to revert had a high carrying capacity if fertilized and used when there was reasonable moisture in the soil. This rainy season the area used for experiments in the past was fertilized with 20 lb. N/acre and carried stock at between 1 : 1 and 1 : 3 acres for four months.

C. *Tuli*

WEATHER

At Tuli a very dry summer was followed by heavy late rains which resulted in a good growth of green grass. This lasted until well into the dry season and the steers should, therefore, winter well at stocking rates in excess of one beast to 15 acres.

The heavily stocked paddocks were all so denuded towards the end of the 1962 dry season that the cattle had to be removed to save their lives. Some of these paddocks could not be restocked until the end of January 1963.

The cattle in the cleared paddocks still show a great advantage over those running in undisturbed veld. As the former animals were of slaughter weight by September 1963 it was decided that they should be sold, as well as any in the equivalent bushed experiment that were suitable for slaughter. Data are shown in the following table. It should be noted that all animals were of the same age (two years, nine months) and that in each case they were run under a three-paddock, one-herd system of management. No animals had ever had supplementary feeding and the only difference was the clearing of bush in the one experiment.

	Stocking Rate	*Average Cold Dressed Weight (lb.)*	*Grades*
Cleared	1:15	549.0	I.R.B. 2 St. A
Cleared	1:20	589.2	5 R.B. 1 Imp.
Uncleared	1:25	483.5	3 St. A 1 G.A.Q.
Uncleared	1:30	545.6	3 St. A

It will be seen that the animals in the cleared paddocks did very much better than those in the undisturbed ones.

BUSH CONTROL

Preliminary results of a ring-barking trial on a wide variety of lowveld trees are extremely promising. Goats continue to have a devastating effect on woody species and are definitely worth consideration in any bush control programme in the lowveld.

RHODES INYANGA ORCHARDS

INTRODUCTION

The station is intended to serve the needs of fruit growers and, to a lesser extent, vegetable growers in the higher parts of the Eastern Districts of Southern Rhodesia. Situated at a height of 5,700 to 6,200 ft., its soils are largely granitic with doleritic influences. The station is leased from the Federal National Parks Department which Department also granted the use of a further ten acres of land about two miles away for potato and soft fruit work.

There are still about 30 acres of old orchards which are gradually being grubbed out. During the year under review further experimental plantings of apples were made, and an approximately similar acreage was grubbed, so that the area under fruit has remained roughly the same.

The Growers' Liaison Committee, which was formed in 1959 to assist the Departmental Research Advisory Committee in formulating and reviewing experimental programmes, met twice during the year. At the first of these Mr. J. Y. C. Thomson tendered his resignation for private reasons. His successor has not yet been appointed.

Though varying a little at different times of the year, the labour force has generally comprised 27 African men and youths with gangs of about half a dozen women taken on to cope with urgent seasonal work. There are two full-time and one part-time European officers employed at the station.

CLIMATE

Probably the outstanding climatic feature of the year was the exceptionally heavy December and the low January rainfall. While this may have adversely affected annual crops such as potatoes, it does not appear to have had a marked effect on deciduous fruits generally. Nectarines were an exception to this, splitting even more than usual (under the dryland conditions). Falls were recorded on 27 days in December, making it the dullest month since sunshine records were started at the station (1955), with only 85.9 hours.

Total annual rainfall at the Packing Shed almost exactly equalled the 1952/61 average. The disparity between falls at this site and the New (Experimental Area) Site noted last year were not so marked this season, there being a difference of only 4.27 in. during 1962/63. Falls at the Mare Dam (potato land) were generally higher than on the station proper, and over the whole year amounted to 12.44 in. more than at the Packing Shed.

Throughout the rainy season maximum temperatures appeared to be 1° to 3° lower than average, whereas night temperatures were sometimes higher than normal. In the autumn this trend continued and the low day temperatures of April and May undoubtedly contributed to the very early blossoming of some apple varieties in sheltered positions during the last week of July. These temperature differences are exaggerated by the records now being taken from a more exposed site than during the 1952/61 period, and *slightly* lower maxima and higher minima are only to be expected. Day temperatures in the latter part of the year have been a degree or two higher than normal, so delaying the flowering and leafing of mid-season and late varieties.

Thermograph reductions showed a total of 699 hours at or below 45°F. at the New Site, and 989 hours at the Apple Management Trial Site (*see* below). From these figures one would have expected considerable delayed foliation to occur — to judge from Californian records. On the other hand, to use the criterion accepted in the Western Cape of South Africa (viz. that if mean June/July temperatures are below 54°F., delayed foliation should not occur), one would *not* have expected it this year. Clearly, a different approach to this problem is necessary for local conditions in Southern Rhodesia.

Total annual bright sunshine was over 200 hours less than in 1961/62 and about 100 hours less than average. Apart from December, mentioned above, the month of April was the dullest on record here, and only October and January were appreciably above average.

Wind figures from the (open) New Site are available for the whole year; those from the Enclosed Orchard for only a part of the year, as the anemometer from the latter was moved to the apple management trial in late June. Also in this trial there are now a thermograph, maximum and minimum thermometers, earth thermometers at 4 in., 8 in., 12 in. and 24 in. depths, and a rain-gauge. These instruments should give a good picture of how the climate of an orchard changes as the fruit trees and associated windbreak mature.

Anemometer readings from the New Site show that the total wind for the year was slightly higher than in 1961/62, averaging 164 miles per day. Runs of more than 300 miles were recorded on 20 days, the highest run of 415 miles occurring, rather oddly, in June.

Soil moisture records were maintained from regular gypsum block readings taken in a mature Ohinemuri apple orchard under non-irrigated fall-down sod. From these it appears that soil moisture only fell below permanent wilting percentage for about three weeks and ten days in October and November respectively — at 9 in. depth, 11 ft. from the trunk. Tree roots alone are unlikely to have been responsible for this depletion; at sites nearer the tree where the moisture level did not fall so low there was probably a greater apple root population, but far fewer weeds because of the shading effect of the tree (which would itself have a cooling effect).

As anticipated in the 1961/62 report, a Dines anemograph, Mark II, was installed in August by the Meteorological Department. Temporarily housed in the Meteorological Assistant's office, this instrument will eventually be moved about 150 yards to the New Site proper, where a small brick building will be erected for it. For the recording of winds in high-and low-density apple plantings, two further cup-counter anemometers are to be installed shortly.

FRUIT CROPS

Fruit sold through the Eastern Districts Fruit Pool, to individual customers who called at the Station, and to a canning factory in Umtali realized only slightly more than in the previous season, £1,009 — just over half the annual revenue of five or six seasons ago. This is in part due to the general running down of old trees, particularly Ohinemuri, in which the percentage cracking increases each year regardless of seasonal weather variations. It is also due to grubbing operations and the grafting over of otherwise experimentally useless trees to collections of varieties, which of course bring in no immediate cash return.

Some apples were sold to a local farmer for the purpose of cold storage tests. Unfortunately these did not materialize since it was found impossible to complete the store in time. It hoped that storage tests will be possible in the coming season. There is no electricity supply on the station.

No variety of fruit was outstandingly good, but crops overall were of reasonable quality. Pears did not crop as well as expected, after a rather small crop in 1961.

NURSERY WORK

Of the apple varieties grafted on Merton 793 stock in September 1962, a number were discarded because of apple mosaic virus infection, while a further fairly large group did not grow well enough to be included in the screening trial this year. However, 53 varieties *were* planted out in this trial — 35 in an extension of the 1962 planting, and the remainder in an irregular piece of land between the *Pinus patula* windbreak and the south-east boundary fence.

More Merton 793 stocks were purchased from South Africa, since production from stoolbeds in the 'eelworm-free' nursery here has been so poor. The new stocks were planted in well-manured land outside the original nursery in the hope that growth may be better. Apart from some oddments for other purposes, over 600 stocks were grafted to about 110 apple varieties for inclusion in the screening trial in 1964.

Strawberries of the varieties Vumba, Everbearing, Festival and Klaradyn were planted out on manured land (*ex* brassica trials) for runner production. Plants of two strawberry varieties were given to the Station by Eastern Districts growers; Sturry Court No. 1 from Mr. B. C. N. Mountain (one of his own crosses), and a reputed Royal Sovereign from Mr. S. Waddacor.

Of the four English strawberry varieties planted at the Mare Dam site two years ago, Cambridge Vigour has virtually died out. The other three varieties are still apparently free from virus infection, but are not doing well under completely dry winter conditions. It is intended, therefore, to bring down the bulk of this material to the Station proper where it can be irrigated and manured. Such practices cannot be carried out at the Mare Dam site because of the risk of eelworm infection of the potatoes.

It was intended to plant a raspberry trial in 1963. Since this has proved impossible, stocks will be maintained in clean condition and deblossomed to prevent seedling contamination of the varieties, until 1964. Polythene sheet buried 3 ft. deep has proved completely useless as a barrier to prevent sucker extension into neighbouring plots; and it *appears* that suckers have penetrated beneath asbestos sheet sunk to the same depth.

Blueberries have flowered and fruited, but not grown well. One possible reason is that their shallow root systems dried out excessively. In an attempt to prevent this happening, a 4-in.-deep manure mulch was applied with old sawdust immediately around the individual bushes to prevent scorching.

A plastic (high density polythene .008-in. gauge) shed was built during the year for the production of seedlings, tip-layering of *Rubus* spp., etc. This did not prove very satisfactory in that the polythene sheet began to crack up after only six months' use. A more suitable material is being sought. During the last season black-currant seedlings were raised and have recently been planted out in the open. Hybrid berries of various kinds are being tip-layered so that the mother plants imported from Oregon may ultimately be destroyed since they are infested with potentially harmful nematodes, and may not, therefore, be planted out in the open ground.

Named varieties of black-currant were, together with the seedlings, planted out in heavily manured land at the nursery. These cuttings, and cuttings of gooseberry imported at the same time, grew well in boxes in a sheltered spot, and were completely pest- and disease-free. They also went into dormancy and came out of it at reasonably normal times. Of the currants, Baldwin made the best growth.

MISCELLANEOUS CROPS

In the absence of a Potato Breeder in the Department, the potato work remained more or less static in that the bulk stock of Up-to-Date, the small variety collection, and the unnamed seedlings were all maintained, but no trials of any sort were carried out. Some tubers of the most promising seedlings were issued to the Seed Potato Growers' Association so that growers may multiply stocks rapidly on one or two individual farms by growing two crops in one year. Such a procedure would not be possible at the Mare Dam site.

Growth of Weeping Love Grass, sown in January on land cropped with potatoes in 1961/62, has been very disappointing. Discussion with a local farmer suggests that this experience has been general. In future, therefore, sowing will take place in November in an attempt to obtain better and earlier cover. Love Grass planted in 1962 continued to grow well, but was subject to a 'malady' which caused the top growth to die off in perhaps a score of roundish patches up to four yards in diameter. This phenomenon was first noticed about the end of the rainy season; the cause was not diagnosed for some weeks. Eventually it proved to be rodents in fairly large numbers which were chewing off the grass at ground level. Trapping revealed that one of the animals responsible is the vlei rat *(Otomys irroratus)*. Presumably this sort of damage would only occur where the grass is uncropped by livestock or by mowing.

Virgin land at the Mare Dam site is being prepared for the growing of soya beans as part of the National Soya Bean/Rhizobium Trial.

Nindi plants introduced in 1961 grew reasonably well during the rainy season but died off completely as soon as heavy frosts began. It is not considered to be worthwhile reintroducing this species.

The plot of Phormium tenax grew extremely well under dry-land conditions this year. Its ground coverage is now such that weeds should no longer be a problem, as they have been since the fans were planted in April 1961. Individual leaves were up to about 6ft. 6in. long at the end September, and most fans (planted singly) had developed into a clump of ten or more. At the end of the winter, outside leaves were becoming yellow — probably as a result of moisture stress.

'Splits' of five varieties of pyrethrum were introduced from the Transvaal in two batches, the first of which arrived in a heated condition and did not, as a whole, thrive. A second batch imported in April and planted out with less delay, were in much better condition, and by the end of the year were looking well. Flowering began towards the end of August. These plants are at present in nursery beds, and will be split up and planted in final positions early in the rainy season.

INTRODUCTIONS

Apart from the strawberries mentioned above, the only fruit plants introduced in 1963 were 12 varieties of apple from New South Wales. As with the collection from South Australia in 1961, some of the scions were top worked on old Ohinemuri trees in No. 7 Orchard. The bulk, however, were grafted on Merton 793 in the nursery for earlier inclusion in the screening trial .

Arrangements to import a fairly large collection of apple varieties from South Africa fell through, and the introductions will probably be made in 1964.

PESTS AND DISEASES

Since trials carried out at the Station by specialist officers of the Department are described elsewhere, it will suffice to say here that the various trials on the control of woolly aphid are still in progress, and that counts of nematode populations are being continued in plots treated with a variety of nematicides. No phytotoxic effects have been seen on the mature apple, peach and pear trees in the treated plots.

Snout beetles were found in large numbers hibernating in the crevices of plastic tree ties. These insects do not seem to have done a great deal of harm to the trees, since their appearance in large numbers did not occur until most of the trees were about to defoliate. They were picked off and killed by hand.

In September, infestation by lepidopterous larvae, tentatively identified by the Entomologist, Umtali, as *Lechriolepis* spp., occurred in the apple screening trial. Similar caterpillars have caused extensive damage to pines locally in recent years.

Culemborg and, to a lesser extent, Kakamas peaches, were infected with peach leaf curl towards the end of the 1962/63 growing season. Since both these varieties, especially Culemborg, were very late in going dormant — and, in fact, many terminal shoots of Culemborg neither shed their leaves nor matured fully — it is not surprising that the disease was prevalent at the start of the 1963/64 season despite well-timed thiram sprays. Symptoms considered to be those of flat limb virus on Missouri Pippin apple have developed considerably during the year, and severe distortion is now obvious on two-year-old trees. Buds of this apparently infected material were inserted on Gravenstein trees of the same age to test for 'graft tranmission'. Similar flat limb symptoms were found on several varieties of apple on a farm in the Melsetter area, and one Rome Beauty tree at Rhodes Inyanga Orchards is showing flattening — but no severe distortion.

TRIALS PLANTED 1962

APPLE SCREENING TRIAL

Measurements were made of girth and extension growth on all varieties, and will be continued for as many years as prove feasible. (Girth will always be possible, but extension growth may be impracticable after three years or so.) Using the figure of a total of 36 in. extension growth of scaffold branches in the first year after planting, 18 out of the 39 varieties in the trial were *poor* growers on Merton 793. WW Pearmain was near the bottom of the list with 16 in. and only 40 in. *total* growth; which is odd since similar trees on the same stock in the district trial planted in 1961 headed the list with an average of 226 in. total extension. The latter trees were, however, given compost and nitrogenous fertilizer, which the others were not given.

All trees in this trial were staked and the majority labelled, although the labels will have to be replaced. Very little mildew was seen and no serious insect damage occurred. Where insufficient scaffold branches were produced in the first season, suitable buds were notched to provide these in the 1963/64 season. One death occurred about mid-season — the cause was not diagnosed.

APPLE MANAGEMENT TRIAL

In general, trees have grown well, in the following order of increasing vigour, WW Pearmain, RI Greening, Starking, Ohinemuri, and Canvada. It is not possible at this stage to map a definite pattern of growth in this trial which could be attributed to soil differences; but a pattern may emerge in the next three years, so that calibrations may be made before differential treatments are imposed.

Pests and diseases were at no time serious, and no woolly aphid has yet been found in the whole of the experimental area. Two deaths, attributed by the Senior Plant Pathologist to attack by *Sclerotium rolfsii*, occurred among WW Pearmain. Very weak trees, dead trees, and those showing symptoms of apple mosaic were replaced from a 'bank' of healthy trees, grown for this purpose under almost identical conditions.

Staking is in progress in this trial, using two uprights and a horizontal cross-piece. Heavy-gauge plastic chair belting, in different colours to distinguish varieties, is being used for ties.

A photographic record has been started of *all* experimental and *representative* guard row trees.

PEACH MANAGEMENT TRIAL

Tree growth has been very good in both varieties, except for those trees which at the outset appeared to have become dessicated in transit, and were slow in leafing. Such trees were replaced as in the above trial.

All trees have been supported with single diagonal stakes. As in the other trials these stakes consist of wattle poles about 2 in. in diameter, boiled in creosote; they are driven approximately 2 ft. into the ground.

To allow strong scaffold branch formation, all trees were completely deblossomed, thus precluding any fruiting in the 1963/64 season.

TRIALS PLANTED 1963

Only two statistically valid trials were planted in 1963, occupying about five acres. They comprise:

APPLE NUTRITION TRIAL

The experimental variety is Starking, with Jonathan and Winesap as guard rows. The latter variety was included mainly because of the need to spread the picking and packing period. The aspects of nutrition which the trial will cover are nitrogen, phosphorus, magnesium, and pH. There is also room for a fifth factor to be introduced later, should this be considered desirable. Soil management will be the so-called traditional, or summer weed fallow system, and spring irrigation will be given to all trees. Since maiden Winesap could not be obtained on Merton 793 stocks, such stocks were planted in their trial positions and grafted *in situ* with our own Winesap scions. Small pine offcut shelters had to be erected to protect each grafted stock from excessive drying out.

Apple Pruning Trial

This trial contains permanent trees, at 24 ft. square, of the varieties Golden Delicious, Rome Beauty and Starking. These are interplanted at 12 ft. square with filler trees of Canada, Rome Beauty and Granny Smith. This gives an initial density of 300 trees per acre, which will be reduced to 75 per acre after an unspecified number of years — before there is obvious interference or overcrowding.

There are four pruning treatments, comprising two forms of open-centre bush, delayed open centre, and the regulated system. Since the fillers may have an influence on the permanent trees in a purely physical, aerial, sense—it was decided that a single replicate composed of permanent trees only should be planted nearby for purposes of comparison. Records of wind speeds will be taken in the two plantings.

In the Inyanga District, a great deal of interest is currently being taken in the intensive system of apple growing practised widely in Northern Italy, known as the 'free palmette'. The objects of the system include the formation of a hedgerow or wall of fruiting wood, not very high, which is easy to spray, pick, etc., and which requires a minimum of winter pruning. There are many aspects of the system about which opinions and practices differ. These include the orientation of the hedgerow. With the twin objects of learning something about the practical difficulties of training a free palmette, and investigating the orientation aspect, it was decided to put in a small 'observation' trial. There are three plots, each of three rows of 14 trees. Each row is of a single variety, these comprising Golden Delicious, Granny Smith and Starking, varieties commonly used in South Africa for this purpose, where large-scale plantings have already been made. The rows are orientated north—south, north-west—south-east, and east—west.

EXPERIMENTAL AREA: GENERAL

The onset of the 1962-63 rainy season was very late. When it did start the rains were not particularly heavy, but nevertheless began to cause serious erosion on the central waterway (between the two management trials). This was unexpected, since the waterway had been left in a very rough state to encourage water penetration, and since cyclone 'Kate', with very much heavier rain had done no damage at the end of the previous season. However, loss of soil was checked by the erection of brushwood fences and the planting of Richmond grass. This was only a temporary measure, and after the end of the rains the whole area was reshaped with the aid of a heavy bulldozer and many weeks of hand labour. It was then sown to Katambora Rhodes and H1 Annual Rye grasses, and given frequent irrigations to promote sufficient growth to prevent erosion in the 1963/64 rainy season.

Felling of the log cypress wind-break which bordered the experimental area on its south-western side was completed in March, as was that of a similar transverse wind-break between old orchards numbers 3 and 4 during the following month. Disposal of the timber from these two wind-breaks has been very difficult. A certain amount has been taken for milling at the sawmill on Inyanga National Park, but the vast bulk remains, becoming less and less saleable. It would seem that there is no commercial demand for cypress, and that most of the timber will have to be dumped into nearby gullies as time and the labour and transport positions permit.

Because of unexpected demands on the labour force in connection with reshaping the waterway, work on the irrigation pipeline as such came to a virtual standstill, during the last few months of the year. Pipe which had been laid earlier was covered with earth and rubble to prevent lifting and consequent disruption of the line during heavy rains. Pipes sufficient to complete the line as far as the Park Warden's house were recently purchased, together with smaller bore pipes for the actual reticulation on the experimental area. It is hoped that some of these pipes at least, will be laid during the early part of the rainy season.

MISCELLANEOUS

The post of part-time Clerical Assistant was regraded to that of Agricultural Technical Officer Grade IV as from 1st July 1963 although the officer occupying the post was, in fact, on leave for the last four months of the year. During this time there was no clerical assistance available. On Mrs. Payne's return she will begin preliminary studies of the soil meiofauna in virgin land and old orchards.

The Farm Manager, Mr. Kroon, was on sick leave at the end of 1962 for three weeks. He also spent one week away from the Station attending a farm machinery course at Domboshawa during May.

The Horticulturist-in-Charge spent three weeks in the Western Cape Province of South Africa, based at the Fruit and Food Technology Research Institute, Stellenbosch. A very thorough series of interviews and discussions covered the work of all sections of the Institute except that connected with grapes. These were interspersed with visits to farms in the main fruit-growing districts including Ceres, Tulbagh, Robertson, Elgin, Villiersdorp and the Lange Kloof.

Since the office constructed in 1955/56, as an annexe to the laboratory, was becoming quite inadequate and very overcrowded it was decided to extend it. This extension was completed in September 1963 and measures 11 ft. by 20 ft. internally.

Labels designed for use in field trials described in the previous Annual Report have not proved a success. A modification in which the plastic *and* wooden sections of the label are coated with a kind of yacht varnish, is now being tested in the field. It must be emphasized that proving a label's worth or otherwise may take several years.

Relatively few advisory visits were possible during the year, but two trips, in December and July, were arranged with the Horticultural Advisory Officer, Melsetter.

A grafting demonstration held at the Station in August was well attended, and provided an opportunity for a brief introduction to the experimental work, which most visitors had not seen.

Notable visitors to the Station during 1962/63 included Lord Wolmer, a fruit-grower and nurseryman from Hampshire; the Hon. J. A. Clark, Federal Minister of Commerce and Industry, and Mrs. Clark; Mr. J. S. Peake, Director of Federal Meteorological Services; Mr. I Den, Controller of Federal Printing and Stationery; and Mr. C. A. Murray, Secretary for Federal Agriculture.

ACKNOWLEDGEMENTS

A debt of gratitude is again owed to various officers of this Ministry, especially in the Department of Conservation and Extension, who have helped in very many ways. Thanks are extended also to the staff of the Federal Meteorological Department; the Warden and staff of Inyanga National Park; the National Parks Building Supervisor, and officers of the Ministry of Water Development, Umtali. Thanks are also extended to the Director, and Messrs. de W. van Zyl, O. Bergh, J. de V. Löster and M. E. L. Buys of the FFTRI, Stellenbosch, and to Mr. D. du Preez of the University of Stellenbosch, for help during his stay there by the Horticulturist-in-Charge; to Messrs. Zondagh Brothers of Avontuur, for their hospitality during his stay in the Lange Kloof; and to the Chief Horticulturist of New South Wales for his gift of apple scions.

SABI VALLEY EXPERIMENT STATION

INTRODUCTION

The Sabi Valley Experiment Station was established in 1951 to provide facilities for the investigation of all aspects of irrigation agriculture appertaining to lowveld conditions.

During the period under review the work of the Station was directed in the main towards obtaining further information on the agronomic and water requirements of the major crops. In addition, studies on the physical characteristics of Sabi East Bank soils continued with emphasis on water availability for crop production, and these studies were extended to include investigations into the physical properties of the sugar-cane soils of the Chiredzi area.

In spite of rather unfavourable summer weather conditions, some very good, if not spectacular, cotton yields were obtained and progress was made towards solving the problems of maize production; mal-distribution and high total rainfall, however, interfered with crop consumptive use investigations.

A good wheat season, productive of much information and some very satisfactory yields, was experienced; this was due largely to the use of more suitable, short-strawed and stem-rust-resistant varieties supplied by the Wheat Breeder.

Outside interest in the work on sugar-cane was maintained, and considerable quantities of improved planting material were supplied to the commercial concerns and to individual sugar planters.

WEATHER

Both summer and winter temperatures were lower than normal, the extremes being less severe and not so marked as in some previous years; this resulted in lower than usual evaporation rates for December to April and a relatively cold and long winter during which one light frost was experienced.

The total seasonal rainfall was again high for the area and, as last year, poorly distributed. Of the 26 in. recorded, 6.39 in. fell in December and 10.08 in. in February which included three storms of over 1 in. and one of 3.06 in. January was relatively dry and hot.

As similarly experienced last year, the high total rainfall and unfavourable distribution interfered with irrigation efficiency work and crop consumptive use investigations.

FIELD CROPS RESEARCH

Agronomic research and observations continued mainly on summer crops of cotton, maize and sorghum; on winter crops of wheat, barley and beans and on lucerne and sugar-cane.

COTTON

Seasonal climatic conditions proved favourable for cotton despite the wet February weather, and high yields of up to and over 4,000 lb. seed-cotton per acre were obtained from most experiments and bulk plantings. In early planted cotton there was some considerable boll drop during December, but this apparent loss of crop had little effect on final yield. Insect pests were adequately controlled by a regular spraying schedule based on weekly egg and larval counts; the chemicals used being sevin and DDT separately and each along with rogor as required for control of red spider. The six-nozzle tail-boom sprayers proved somewhat inefficient on tall crops late in the season and at this stage of growth a change to eight nozzles is indicated.

Variety, spacing and fertilizer experiments were conducted, as well as comprehensive trials on water requirements and on irrigation control. A variety trial averaged 3,529 lb. seed-cotton per acre for nine varieties of which the commercial Albar 637 gave the highest yield of 3,907 lb. and the large-bolled varieties, Acala and Arkot, 3,456 and 3,371 lb. seed-cotton per acre respectively. Trials testing a range of between-row and in-row spacings showed no significant yield differences on Mopani Class A soil, but highly significant differences in favour of close spacings at Chisumbanje; on Mopani soil, growth was less rank than normal, which factor may have masked expected differences in plant densities, whereas on heavy basalt soil at Chisumbanje the vegetative growth was as usual extremely dense.

Results from a water-duty nitrogen study indicated that vegetative growth was influenced more by nitrogen level than by soil moisture status, and demonstrated the requirement of up to 80 lb. N per acre for high cotton yields. Yields of well over 4,000 lb. seed-cotton per acre were recorded from large-scale plantings on heavy Mopani C Class soil fertilized with ammonium sulphate at the rate of 90 lb./acre N.

Studies on the problem of 'cotton-drop' showed that loss of crop under the conditions was negligible where picking was done regularly and efficiently.

MAIZE

Yields of *maize* from experimental plots and from large-scale plantings were reasonably good for Sabi conditions despite severe lodging and overall damage to cobs due to diplodia and fusarium rot. A test of 30 varieties, including a number of short, quick-maturing South African hybrids, averaged 27.6 bags per acre, with a top yield of 34 bags from SA5. A similar trial, using a more limited range of varieties and conducted on heavy basalt soil, gave a lower average yield of 23.3 bags with the best return of 28.7 bags from the new Southern Rhodesia hybrid No. 52. Comparatively satisfactory commercial yields of over 36 bags per acre were obtained from furrow-irrigated SRH No. 11 maize on acacia soil.

In a single fertilizer test on Mopani soil, plots receiving 60 lb./acre P_2O_5 in triple supers showed a significant enhanced yield at the rate of over three bags per acre whereas potash at 60 lb./acre K_2O applied as muriate depressed yield, although not significantly, by some two bags grain; it may be that the phosphate reserves or availability thereof are being reduced or altered by cropping on this soil type.

It would seem that the problem of lodging in maize may at present be overcome by using the short, sturdy and quicker-maturing South African hybrids, along with soil treatment with dieldrin for termite control. Although tests indicated that variety SA5 did not yield significantly better than the Salisbury hybrids, it was better suited to the area agronomically. The main problem in maize production, however, still remains that of finding or breeding varieties better suited to the conditions of climate and soil, and to this end the assessment of introductions and of Salisbury top-crosses requires to be continued.

SORGHUM

Work on *sorghum* was invalidated by substantial grain loss due to the development of moulds in the heads while the crops were ripening off during December, the trials having been planted early to avoid the ravages of sorghum midge which caused much damage last year. Sorghum is well suited ecologically to the conditions and is capable of very high yields of both grain and silage material, but investigations over the past two seasons indicate that it may be difficult to fit this crop into an irrigated farming system.

WHEAT

Excellent stands of *wheat* were established and crop growth progressed satisfactorily throughout the season especially following lucerne in the rotation; climatic conditions somewhat colder than normal appeared to be favourable for the crop and for barley. Some good yields were obtained from the new and promising material introduced by the Wheat Breeder, and the main crops remained relatively free of stem rust although eventually all varieties showed evidence of leaf rust infection to a greater or lesser extent. Quelea damage appeared to be much less than usual.

Yields of over 20 bags grain per acre were recorded from crops planted during the first week of May, but crops later planted, for example using the stem-rust-resistant Yactana, were badly attacked by leaf rust which resulted in much lower yields than expected.

Variety studies on some 40 strains of wheat, replicated and in observation and bulking plots, indicated yield potentials varying from 8 to 20½ bags grain per acre and provided valuable information on susceptibility to both stem and leaf rust. A repeat spacing and seed-rate trial on two varieties of very different growth habits showed no significant differences in yields from between-row spacings of 7 in. and 14 in., and from seed rates of 60 and 90 lb./acre; the mean yield from this trial was 16.2 bags grain/acre.

A fertilizer trial on wheat following lucerne and following a lengthy period of cropping, testing four levels of nitrogen in the presence and absence of phosphate and potash, gave results as tabulated below; phosphate and potash had no effect on yield:

	Yields: bags/acre	
	Following lucerne	*Following cropping*
Nil	14.49	5.12
40 lb. N/acre . .	17.96	8.95
80 lb. N/acre . .	21.76	13.76
120 lb. N/acre . .	22.80	17.28

The wheat crop following lucerne was uniformly well grown and of excellent colour throughout; the above figures show the spectacular effect of the ley on grain yields. It is seen also that there was a strong linear response to nitrogen both after lucerne and after annual cropping, the latter response being most marked and still rising at the highest level of application. This is a most important finding; in the past there has been a marked response to nitrogen up to 80 lb. N only, but the use in this trial of a short-strawed variety, resistant to lodging and to stem rust, has allowed the higher nitrogen levels to become effective resulting in much higher grain yields. The increasing incidence, however, of leaf rust on the wheat crops is now a major problem which urgently requires investigation and correction by introducing varietal resistance.

BARLEY

Results of *barley* trials and observations on the crop are not yet to hand.

BEANS

Satisfactory stands of *beans* were obtained by seeding about 3 in. deep into wet soil some three to four days after an irrigation, a second irrigation being required at emergence. But subsequent growth and colour were irregular and patchy despite a generous planting dressing of nitrogen, and it is evident that much investigation still remains to be done on production of beans for seed under irrigation on Sabi soils.

Some good and encouraging yields were obtained, however, notably from a *white haricot, type No. 19193,* which gave over a ton of seed, and from ***White Processor,*** top yielder last season, which produced over three-quarters of a ton of cleaned seed per acre. Heretofore the white-seeded varieties, which are in demand on overseas markets, have in the main proved to be shy yielders, highly susceptible to rust, and it is encouraging that certain white haricot varieties have now been found capable of high yields.

Further experiments on planting methods provided more detailed information on in-row and between-row spacings for maximum production, and a repeat nitrogen trial confirmed that substantial fertilizer nitrogen appears to be necessary for satisfactory bean-seed production under Station conditions.

LUCERNE

Work on *lucerne* was confined to the establishment of two field trials, one testing presence and absence of sulphur, potash and a trace element mixture on lucerne growth and production, and the other comparing the effects of a wide range of levels of gypsum on soil conditions under lucerne. Variety Caliverde was planted by machine in 14 in. rows at about 25 lb. seed per acre, with a starter dressing of 20 lb. N applied in ammonium sulphate.

The productivity of the lucerne crop has been disappointing to date, and certain new stands have thinned appreciably and rapidly during the first season following establishment, allowing the grasses to take over. This situation appears to be related to soil compaction which results in poor and inadequate infiltration or acceptance of water during irrigations; lucerne root development is thereby inhibited and the shallow rooting grasses favoured. The problem has not been investigated so far to any extent.

SUGAR-CANE

The Sabi nursery collection of *sugar-cane* material was increased during the year to 70 named varieties by introductions from EAAFRO, arranged by the Chief Botanist and Plant Pathologist. Thirty-seven varieties, mainly comprised of the earlier introductions, were planted out in three-row plots with the object of studying growth habits and making a comparison assessment of yield and sugar content capabilities. Identical conditions of cultivation, fertilizer application and irrigation allowed a valuable although non-critical comparison to be made. No diseases of any consequence were observed and no evidence of smut, although this disease had been found (and dealt with) in the parent nursery.

Many of the varieties commenced to lodge at six months from planting following a prolonged period of rainy weather, and at harvest only five varieties showed complete absence of lodging. Growth measurements conducted on ten varieties revealed a steady increase until late April when the cane was seven to eight months old and very well grown for its age. Thereafter, and during the cooler months, growth rate decreased markedly with the result that the final yields of cane were not as good as hoped for. A contributory factor to the reduced growth rate and lower-than-expected cane yields may have been the failure to apply adequate nitrogen.

Cane yields, however, and sucrose content were reasonably good by commercial standards and a substantial number of varieties by comparison yielded more cane and gave higher sucrose contents than the presently popular varieties N: Co 310 and N: Co 376.

Much interest in this work was shown by the commercial sugar concerns and by small cane planters, and varietal material, as requested, was supplied to Triangle Ltd., to Hippo Valley Estates and to Chirundu Sugar Estates Ltd.

ROTATION TRIALS

Test cropping to maize of the Mopani rotation plots on both A and C Class soil continued, the plots being split for presence and absence of nitrogen (90 lb. per acre N); the object of this work is to study the decline in productivity of these soils following continuous cropping. The maize yields following lucerne and following annual cropping are given in the summary table below:

	Class C Soil		*Class A Soil*		
	N	*NO.N*	*N*	*NO.N*	*Means*
Following lucerne in 1961	34.67	22.41	29.08	16.60	25.69
Following annual cropping cycles . . .	31.66	15.70	21.67	10.81	19.97
	33.17	19.05	25.37	13.71	
	26.11		19.54		

It is seen that the beneficial effect of lucerne on subsequent maize production is still evident, although reduced on Class C soil in the presence of nitrogen. Again, the higher production potential of the Class C soil is strongly indicated, the response to nitrogen on Class C being greater than on the lighter Class A soil.

As experienced last year, however, the wheat crop following maize showed no evidence of any residual benefit from the old rotation. Yields of early planted Yactana showed as before that Class C soil gave significantly higher yields than Class A (13.4 and 9.5 bags respectively), the difference being most pronounced in the absence of nitrogen.

Also, the practically important observation was made that the greater response to nitrogen was obtained from those plots longest out of lucerne.

IRRIGATION EFFICIENCY STUDIES

Little progress was made in this work due to crop failures and to pressure of other work. Tests were confined to the 500-ft.-long plots on Mopani C Class soil, planted to cotton and lucerne followed by wheat. In previous years, difficulty had been experienced in obtaining efficient distribution of water on this heavy soil using flows of one and two cusecs, and this season an examination of water distribution as shown by crop growth and yield was made comparing half and one cusec leading streams. For the cotton crop, which produced on average over 4,300 lb. seed-cotton, no significant differences, as found in former investigations, were observed between total yields under the two flow rates, but less water was applied using the lower leading stream (half cusec); this latter observation is contrary to previous findings. Sub-plot sampling showed that yields (and hence water distribution) over the first 350 feet of plot length were fairly uniform but tailed off gradually thereafter indicating either a surplus or a shortage of water at the end of the runs.

Irrigation Efficiency studies on lucerne (on both heavy Mopani and on sandy-loam Acacia soils) had to be abandoned due to poor and uneven growth of the crop leading to substantial stand reduction and grass encroachment particularly at the lower ends of the plots.

A critical review and evaluation of the past four to five years' results and observations will be carried out before further work on this important subject is contemplated.

CROP WATER USE AND IRRIGATION CONTROL INVESTIGATIONS

The objectives of this work are—

(a) to determine the water requirements of the major crops, and the depth of water withdrawal at different stages of growth; and

(b) to assess the optimum coefficient applicable to Class A open-pan readings to provide an estimate of evapotranspiration that could be used as a practical basis for irrigation control.

In the past, water-use investigations have been conducted on crops receiving optimum water applications; this approach was altered to include a range of irrigation treatments which were determined by applying different factors to open-pan evaporation and by assuming different rates of available soil water depletion. Soil sampling procedures were as previously described, and the depths of water withdrawal were determined by means of tensiometers and by gypsum and nylon blocks.

The results and observations on wheat and beans are not yet available. In the *cotton consumptive use trial*, six soil moisture régimes were compared, consisting of a comparison of two pan coefficients (0.9 and 0.4 E_0) each at three levels of available moisture depletion (50, 75 and 100 per cent.). The highest average yield of 3,949 lb. seed-cotton per acre was recorded from a comparatively wet treatment which received 23.5 in. of irrigation water (47.9 in. with rain) in ten irrigations; a substantially lower yield of 2,813 lb. seed-cotton was obtained from the driest treatment which received 9.5 in. irrigation water in four irrigations. Consumptive use patterns of the crop differed considerably under the different treatments; the mean $^{E}t/E^{\circ}$ ratio varied between 0.79 and 0.59, the peak $^{E}t/E^{\circ}$ ratio between 1.25 and 0.76 and the period of maximum consumption commenced at 12 to 15 weeks and ended at 16 to 20 weeks from planting.

Very marked visual differences in growth, vigour, plant size and structure, etc., were evident in this trial and much information in this regard will be forthcoming when the ground cover and other phenological data recorded have been processed.

The *cotton irrigation control trial* provided five irrigation treatments for comparison in combination with four nitrogen levels to determine whether cotton growth could be reduced by striking the correct balance between soil fertility and available soil moisture without reducing yields.

Yields of seed-cotton, plant height, number of bolls per plant and a 'density index' were taken; the highest average yield in this experiment and contrary to the previous finding, was obtained from a comparatively dry treatment which received 13 in. of irrigation water (37.1 in. with rain) in four irrigations; yields were depressed considerably by very wet and also by very dry treatments. It was shown that the effect of nitrogen was linear up to 80 lb. N per acre which confirmed results from past fertilizer trials, and similarly the best irrigation treatment confirmed results obtained previously from gravimetric work in consumptive use trials. Further important conclusions from this trial are as follows:

(1) The irrigation treatments were only really effective during the early growth stages to flowering, the subsequent soaking rains having had no effect on treatment differences.

(2) Rank vegetative growth appears to be influenced more by nitrogen level than by moisture status.

(3) It would appear that any attempt to reduce plant size by limiting either nitrogen or soil moisture will inevitably result in yield losses.

A similar although somewhat more comprehensive *irrigation control experiment on maize* also indicated a striking increase in yield as the treatments decreased in wetness, the highest return of 23.1 bags being obtained from the driest treatment which received 15.8 in. irrigation water (39.6 in. with rain) in four irrigations.

LABORATORY AND SOIL RESEARCH

As in previous years, the Laboratory Section spent most time on routine soil moisture determinations and on the evaluation of results in connexion with investigations into the water requirements of the major crops; the results of this work are given in the Agronomy Section reports and are referred to above in this summary.

Compilation of data on the physical properties of Sabi Valley soils continued and some soil physical work was done on certain sugar-cane soils from the Chiredzi area.

Sucrose and fibre determinations were made at four- to five-week intervals over a four-monthly period on 37 varieties of sugar-cane from the introduction nursery.

Soil physical studies included:

(a) Water retention measurements on each site used for consumptive use experiments, and at 1/10, 1/3, 1, 4 and 15 atmospheres suction on representative profiles of the main Sabi and Chiredzi soils.

(b) Particle size distribution by mechanical analysis with particular reference to the heavy Mopani C Class soils. These were shown to vary texturally very considerably over short distances with the common feature of becoming heavier with depth.

(c) Wilting point determinations using the sunflower method (pots seeded to cotton, wheat and beans as well as to sunflowers for comparison with the laboratory method at 15 atmospheres suction. The sunflower method consistently gave lower figures for the various soils tested and indications are that use of the laboratory method could result in an underestimation of the amount of water available to plants by up to 20 per cent. in the top soils alone.

(d) Infiltration rate studies on Acacia long plots and grade plots which, as is normal, showed large differences between sites but no definite trend in water acceptance rate which could be associated with crop growth except on certain of the grade plots where conditions had been substantially affected by mechanical soil movement and compaction. For Acacia soil the basic infiltration rate was found to be approximately 2.2 in. per hour which was reached about 20 minutes after the start of an irrigation.

Tensiometers and gypsum blocks were successfully used to trace depth of water withdrawal and hence root growth in cotton, wheat, beans and sugar-cane. Cotton roots were found to be active at a depth of 69 in. and sugar-cane at peak growth extracted water from a depth of 45 in. on Mopani soil.

GENERAL

A section of 1,400 ft. of the main canal entering the storage dams was replaced by the Irrigation Department, the opportunity being taken to test various mixes of cement, sand and aggregate.

Station maintenance of a high order was carried out during the year; a building to house the cotton gin was erected and the machinery satisfactorily installed.

Liaison with the Southern Rhodesia Department of Agriculture continued.

A Research and Advisory Committee was set up to advise on problems connected with development in the Chiredzi area, and a number of visits were made to Triangle Limited and to Hippo Valley Estates to assist with experimental work on sugar-cane and citrus.

GWEBI AGRICULTURAL COLLEGE

INTRODUCTION

The College year under review commenced on 5th October and Diploma Day was held on 17th October 1962, with Their Excellencies the Governor-General and the Countess of Dalhousie as the guests of honour. Lady Dalhousie presented the diplomas to Course 12 and the trophies and prizes to Courses 12 and 13. The final Diploma Day under the Federal Government was held on 16th October 1963 with Dr. and Mrs. Romyn as guests of honour.

Gwebi College commenced, in early 1950, as a Southern Rhodesia Government institution. By agreement with the Central African Council its doors were open to a small quota of students from Northern Rhodesia and Nyasaland, as well as to the majority entering from Southern Rhodesia. In 1954 the College became a unit of the Department of Research and Specialist Services, Federal Ministry of Agriculture and after a while it was agreed that students would be offered places from a general list of applicants from all three Territories and there would no longer be a quota for the Northern Territories. The bulk of students have continued to come from Southern Rhodesia, the proportion from Northern Rhodesia has been considerable in some years, and very few have come from Nyasaland. The College Advisory Council has been assured by the authorities that, with the break-up of the Federation, Gwebi College will continue as usual, under the Southern Rhodesia Government. Once again the College continued to be of adequate size to satisfy the requirements of the Federation in the training to accepted standard of properly qualified young men in the science and practice of agriculture.

EDUCATION

Thirty-three students of Course 13, the largest second-year course in the history of the college, sat the Final Diploma examinations in July 1963. Thirty-two of these men obtained the Gwebi Diploma, nine of them being first class. Thirty of the 34 students in Course 14 satisfied the examiners and will return for second-year studies.

Practical tobacco instruction continued to fit well into the programme and 'outdoor teaching' continued with visits to farms, research stations and laboratories and places of general agricultural interest.

The short tour took the second-year students (Course 13) to Grasslands Research Station and to farmers in the Inyazura-Rusape areas. At Inyazura a visit was paid to the farm of the Chairman, College Advisory Council, Mr. E. R. Campbell. At Grasslands, particular attention was paid to 'ley farming in the higher-rainfall sandveld areas', whilst on the farms studies were made of tobacco production, dairy and beef herds and 'haylage' production in a tower silo.

The long (main) tour was in the area Norton-Hartley-Gatooma-Chakari. Agricultural enterprises studied included beef and dairy herds, pigs, poultry, Virginia flue-cured and Burley tobaccos, groundnuts, cotton, citrus, hybrid maize production and sorghums. The ginnery and spinning of cotton at Gatooma mills was observed and the Dairy Marketing Board plants there were visited.

DEVELOPMENT

The Burley barn, near the grading shed, was completed and used; although designed to take half an acre of crop it comfortably took the production of 1,500 lb. (cured leaf) from one acre.

The Ministry of Works' extensive alterations and renovations at the college hostel will considerably improve living accommodation and appearance.

New buildings were completed in the poultry plant to house developments in nutritional and physiological research.

Otherwise, there were no developments of note.

PRODUCTION

Total rainfall was even more above average than last year, being 47.94 in. as compared with a 50-year mean of 32.61 in. Monthly distribution can be seen from weather details given under the Research heading below. The rains started intermittently on 6th November 1962 and by 14th November heavy rains had begun. November rainfall was about average but December was very wet. The actual quantity was not so significant as the regular distribution which resulted in long, cold, wet periods. There were two weeks of dry weather in the middle of January but the last week of January was wet, as was all of February. The rains tailed off from the middle of March but there were still occasional showers until 17th April when fine weather became established. Generally, 1962/63 was a wet, difficult season.

The following figures give the facts regarding land utilization and field production on the Gwebi College Farm, season 1962/63:

Crop	*Acres*	*Production*	*Yield/Acre*
Maize grain (Broadbalk)	89	1,744 bags	19.5 bags
Maize grain (Gwebi South)	165	2,286 bags	13.8 bags
Maize grain (Mundy South)	14	222 bags	15.8 bags
Maize silage (Broadbalk)	11	132 tons	12.0 tons
Maize silage (Gwebi South)	15	142 tons	9.4 tons
Maize silage (Mundy South)	21	273 tons	13.0 tons
Maize-legume silage (Broadbalk)	11	137 tons	12.4 tons
Legume silage (Broadbalk)	9	19 tons	2.1 tons
Soya-bean seed (Gwebi South)	24	73 bags	2.2 bags
Ration beans (Broadbalk)	15	7 bags	0.4 bags
Potatoes (Broadbalk)	7	238 bags	34.0 bags
Groundnuts (unshelled)	21	352 bags	17.0 bags
Cotton	¼	274 lb.	1,096.0 lb.
Burley tobacco	1	1,482 lb.	1,482.0 lb.
Virginia tobacco	9	8,480 lb.	942.2 lb.

Note: Bags grain maize = 200 lb. net.
Bags groundnuts unshelled = 65 lb. net.
Bags ration beans = 200 lb. net.
Bags soyabeans = 200 lb. net.
Bags potatoes = 150 lb. net.
Silage yields are estimates based on the number of loads, by weight of one load.

A 'high fertility' plot of maize was grown in the College garden, half an acre in extent, and yielded at the rate of 44 bags per acre; the seed was single-hybrid, heavily manured and fertilized, of high population and watered when necessary. The strips of maize on Broadbalk varied from 13 to 30 bags per acre grain. Maize silage varied from 9 to 18 tons per acre on various strips.

Virginia tobacco was sold at an average price of 32.5d. per lb. and Burley tobacco at 35.0d. per lb.

The Friesland herd continued on the high level of production achieved in recent years. The following figures give overall herd averages, including first calvers:

Year	*Lactations*	*Milk (lb.)*	*Butterfat (lb.)*	*Butterfat (per cent.)*	*Days*
1958-59	35	9,457.8	346.25	3.66	291
1959-60	41	9,960.0	354.06	3.61	294
1960-61	24	9,984.8	337.90	3.44	292
1961-62	34	9,872.9	349.74	3.56	299
1962-63	34	9,466.3	354.12	3.76	298

The policy of lambing down the Blackhead Persian sheep three times in every two years as opposed to single lamb crops annually has resulted in an annual lambing percentage of 120 per cent. against the generally accepted figure of 70 to 75 per cent.

Figures from the Hereford herd demonstrate quite clearly the decisive superiority of early calves. Calves from the imported English bull are exceptionally good and have many show successes to their credit.

The College continued to support the litter testing and sow recording schemes. At a Colcom field-day a carcass from the College was exhibited as the most outstanding carcass produced in the Federation in respect of length and proportion of forequarters to hindquarters.

RESEARCH

Very little research was carried out, time and funds being limiting factors at the College, where student education has priority.

THE WEATHER, RAINFALL AND TEMPERATURES: 1962/63 SEASON

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	Total
Rain, inches . . .	—	0·02	—	—	5·06	14·21	6·86	15·28	4·30	1·97	—	0·24	47·94
50-year mean . . .	0·03	0·07	0·20	1·01	3·87	6·57	7·66	7·10	4·32	1·27	0·39	0·15	32·61
Rainy days	—	1	—	—	15	26	14	23	14	8	—	2	103
Days ¼ in. plus . . .	—	—	—	—	5	15	8	13	5	2	—	—	48
													mean
Mean max T° . . .	70·8	76·2	81·7	87·2	80·3	74·9	78·7	75·3	77·9	76·5	73·1	71·7	77·1
Mean min T° . . .	41·3	43·8	46·1	54·7	60·3	61·5	59·0	59·0	56·8	51·9	42·1	38·6	51·3
Mean T°	56·1	60·0	63·9	70·9	70·3	68·2	68·9	67·1	67·3	64·2	57·9	55·2	64·2

OBSERVATION PLOTS

Fewer critical experiments but more observation plots were grown to give a practical demonstration of crops covered in lectures but not normally grown on the College farm.

(i) Hybrid sorghum NK.300 gave good yield — 35 bags per acre.

(ii) Other sorghum gave 10 to 16 bags per acre grain and 10 to 25 tons green matter per acre.

(iii) Eighteen varieties of soya bean were grown; top growth was good but yields were only 6 to 10 bags per acre.

(iv) Wheat of the Marodzi variety was sown through a decaying mulch of rape which did not grow well and, therefore, did not smother out the weeds as intended. However, the wheat grew well and yielded 6.5 bags per acre.

(v) Single hybrid maize, No. 52, yielded 36 bags per acre under poor conditions and *systates* beetle attack.

(vi) In a comparison between four varieties of wheat and three of barley yields varied from three to nine bags per acre.

(vii) A plot of Turkish tobacco on heavy red soil demonstrated that, with a high plant population and limited amount of fertilizer, good-quality leaf could be produced.

(viii) Safflower N.10 was a complete failure due to a bad attack of root rot (*Phytophora* spp.).

(ix) Jack beans, velvet beans, *crotalaria intermedia* and dahl all grew and seeded well.

(x) Four varieties of castor beans grew well but yields were poor due to poor varieties and diseases.

MAIZE VARIETIES

Yields were poor due to *systates* beetle attack. 59H17 gave the highest yield at 24.6 bags per acre, followed by 60H13 at 21.8 bags per acre and Southern Cross last at 11.4 bags per acre.

Sunflower Varieties

Six dwarf and semi-dwarf varieties were compared at different seed rates. Yields were generally poor due to wet weather and diseases. Top variety was Short Russian, 11 bags per acre, and poorest was Ella, four bags per acre.

Potatoes

In an early planted trial two varieties and different quantities of water and planting dates were employed. Up-to-Date was the best variety, yielding 160 bags per acre.

Groundnut Varieties

Plants grew well above the ground but pod development was poor and yields disappointing. Mount Mukulu Red was top with 4.3 shelled bags per acre.

Control of Systates Beetle

In an experiment carried out in conjunction with Entomology Branch *Heptachlor* was the most effective chemical.

Student Steer Trial No. 5

This trial is nearing completion. The trials are designed to produce good-quality young beef economically and to study differences which might arise, particularly between indigenous and exotic cattle or crossbreds. So far there has always been greater variation within breeds than between breeds, and there has not been any significant difference between breeds under the systems of management practised.

Poultry

On the return of the Lecturer in Poultry from the United States of America, the research programme in the Poultry Plant was changed radically from breeding research to nutrition and physiology but, as the lecturer has now resigned, this will probably come to a stop.

Engineering

In the Engineering Section, whilst no formal experiments were in progress, assistance was given to Work Study Branch (Department of Conservation and Extension) in the development of a tobacco-harvesting machine, and an investigation with pizometers into waterlogging in Broadbalk field was carried out.

AGRICULTURAL SHOWS

The College again exhibited a considerable string of Friesland and Hereford cattle at the Bulawayo, Gwelo, Salisbury and Umtali shows. First-year student volunteers again prepared and showed the animals, gaining valuable experience and making many new friends for themselves and the College. The College won a very considerable number of awards.

COMMITTEE WORK

The Principal continued to serve as a Federal Government representative on the Farm Mechanization Standing Committee and acted as referee and judge at various ploughing matches.

FELLOWSHIP

The Principal was awarded a United Nations Food and Agriculture Organization Fellowship to study methods of agricultural education in the Lebanon, Greece, Italy, United States of America and the United Kingdom.

STAFF

Towards the end of the year the staff complement was at full strength. The appointment of Mr. H. R. Mundy as Vice-Principal was widely welcomed.

CHIBERO AGRICULTURAL COLLEGE

During the year under review, the College made significant progress towards the eventual aims and objects planned for it.

STAFF

APPOINTMENTS

Mr. D. M. Rix, B.Sc. (Afric.) (Natal) as Lecturer in Animal Husbandry, on the 21st December 1962, on transfer from the Department of Conservation and Extension.

Mr. D. J. Johnstone, Dip.Agric.(Potch.), as Instructor in Animal Husbandry, on the 27th November 1962.

Mr. B. S. van Onselen, as Farm Assistant, on the 2nd January 1963.

Mr. E. Ruzwidwo, as Medical Orderly/Hostel Supervisor, on the 18th July 1963.

RESIGNATIONS

Mr. P. J. Cuthill, Lecturer in Animal Husbandry, on the 30th November 1962.

Mr. S. N. Kutshwa, Medical Orderly/Hostel Supervisor, on the 14th July 1963.

THE COLLEGE ADVISORY COUNCIL

The Advisory Council held three meetings during the year, while two Council sub-committees met and reported on the 'Commencement of the College Year', and 'Short Courses'. As a result, the decision was taken to change the commencing date of the academic year to the 1st April, to come into effect on the 1st April 1964 with the enrolment of Course 4.

THE FIELD HUSBANDRY SECTION

THE 1962/63 CROPPING SEASON

Total rainfall for the season was 40.15 in. Although this was considerably higher than the previous seasonal total, it was lower than that experienced by most other farms in the district, and was badly distributed, resulting in much inconvenience in planting operations, cultivations, and the reaping of tobacco. A three-week drought at the beginning of January, combined with a severe hail and wind storm, caused considerable damage to crops, in particular the tobacco.

DEVELOPMENT

The most significant achievement has been in the establishment of the tobacco section. Starting in July 1962, in a race against time, a permanent seed-bed site was established, complete with borehole and water reticulation. Two flue-curing barns, one conventional and one of the Shiloh type, were built, together with a grading shed. A thatched Burley shed and a Turkish 'stow-away' shed were added soon afterwards, providing facilities for the growing, curing and grading of six acres of Virginia and one acre each of Burley and Turkish tobacco.

Storage facilities on the farm have been vastly improved this year by the erection of a 70-ton capacity grain silo, and the extension of the original 40-ton silage bunker to hold 200 tons.

Further progress has been made towards the establishment of a series of sound crop rotations, with the opening up of 50 acres of new lands, and the establishment of 30 acres of Katambora and Giant Rhodes Grass leys. The whole of the non-arable portion of the farm is now suitably enclosed into grazing paddocks, and the improved pastures, which will eventually be used for intensive strip grazing by the dairy herd, have been fenced.

Work is now drawing to a close on the completion of a small earth-dam of roughly 2,000,000 gallons capacity. This has afforded valuable instruction to students, and will eventually be used for fish-farming.

CROP PRODUCTION

Virginia Tobacco.—Little difficulty was encountered in establishing an excellent stand of tobacco, which grew extremely well in comparison with many crops observed in the surrounding districts. Some inconvenience was experienced in February in reaping, owing to poor rainfall distribution, and an estimated 200 lb. per acre of cured leaf was lost as a result of a hailstorm, while that leaf which was salvaged cured green and helped to lower the final average price for the crop.

Burley Tobacco.—Although it did not grow out to the full reputed potential, the overall performance of the crop was very encouraging. Some of the earlier reapings suffered from excessively humid conditions during curing, but much experience has been gained during this first year, from which it has been decided to make certain modifications to the curing shed, and general procedure next season.

Turkish Tobacco.—A somewhat disappointing start was made with the establishment of the seed-beds, which were washed away in a heavy storm soon after sowing, leaving insufficient seedlings at the right time for planting the planned one acre. However, the three-quarter acre which was planted grew well, and apart from a heavy infestation of white mould, a good yield of fair-quality leaf was reaped and cured.

Maize.—Forty-five acres of various maize hybrids were established. As with most other crops, planting was delayed for some time owing to the late onset of the rains in November. Thereafter the crop grew vigorously, in spite of further difficulties in clearing the weeds out during the long wet periods. Ten acres of maize were grown specifically for silage, in combination with ten acres of soya beans.

It is of interest that one land gave a yield of just over 32 bags per acre of maize, the best yield so far at the college.

Groundnuts.—One particular five-acre stand of Valencia groundnuts grew extremely well throughout the season and produced equally excellent results when harvested. Small plots of other varieties were grown, mainly for observation.

Soya Beans.—This crop has continued to prove disappointing, in spite of careful attention to all the recommended cultural practices, such as inoculation of seed. Sixteen acres were grown, of which ten acres were made into silage, and the rest harvested for grain, and sold.

Other Crops.—One block of miscellaneous crops was grown, mainly for instructional purposes, comprising one-acre blocks of cotton, castor beans, sunflowers and pumpkins. Although the cotton promised to yield well, and pests were kept to a minimum, it was unfortunately severely damaged by contaminated spray, and was almost a complete failure. The castor beans, which were grown this year for the first time, grew very unevenly, and proved difficult to reap. Small acreages of sorghum, sunnhemp, dolichos beans and sugar beans were grown. The yield of sorghum was severely reduced by bird damage but the sunnhemp grew very well, and a heavy crop was turned under as green manure.

On the three-acre Irrigated Section, small blocks of assorted vegetables are in continuous production, together with rape, oat/lucerne mixture, potatoes, etc. In addition, two observation experiments, one on wheat and one on cotton, have been grown, and a permanent grass nursery has been established including, at present, 15 different species of pasture grasses.

Crop Yields.—Virginia tobacco (sold weight), 1,103 lb. per acre from six acres, average price 35.18d.

Burley tobacco (sold weight), 1,174 lb. per acre from one acre, average price 31.26d.

Maize, 21.9 bags per acre from 35 acres.

Groundnuts, 40 bags per acre unshelled, from five acres.

Soya beans, five bags per acre (Hernon 147) from two acres.

Cotton, 377 lb. per acre from one acre.

Silage, 17 tons maize, four tons soya beans per acre (10 acres each).

Sunflower, eight bags per acre from one acre.

Sorghum, 2½ bags per acre from four acres.

Natal sugar beans, 4.8 bags per acre from five acres.

Research.—The following figures have been obtained from small observation trials:

1. Groundnut observational trial—

Murambatswina	20.2 bags pods per acre
Bambey 48-7	17.7 bags pods per acre
Mwitunde	19.8 bags pods per acre

2. Time of planting supplementary irrigated cotton—

Planted October 11th	2,287 lb. per acre
October 25th	1,016 lb. per acre
November 8th	835 lb. per acre
November 22nd	147 lb. per acre

3. Soya bean observational trial—

Hernon 147	4.86 bags per acre
Hernon 107	3.96 bags per acre
Bansei	0.99 bags per acre

THE ANIMAL HUSBANDRY SECTION

The Dairy Herd

Only one Jersey cow was purchased during the past year and the herd was subsequently 'closed'. The average production is approximately 19 lb. per cow per day. The original bull, generously presented to the College by Lord Acton, Council Chairman, died unexpectedly but was replaced by the purchase of a bull from Lord Acton's herd. Three grade cows also died but natural increase resulted in seven bull calves, all of which were sent to the Cold Storage Commission, and a total of nine heifer calves. The herd had access to adequate good-quality roughage in the form of bean forage during mid to late summer, and silage, bean hay and veld hay, during winter.

The Beef Herd

The Mashona herd has rapidly reached the desired strength of 30 breeding animals. Two cows and a heifer were received from Makoholi Experimental Station and 27 weaner heifers from Grasslands Research Station. The herd now also includes a bull, which was purchased through the Society from Mr. F. B. Willoughby, and one heifer and two steers from natural increase.

Sheep

A sheep-house has been built which could accommodate about 200 sheep. The Blackhead Persian flock now totals 67 ewes and 57 lambs, while the lambing percentage is slightly under 100 per cent. In addition to the one ram received last year, the flock recently acquired a further three from Gwebi Agricultural College.

Pigs

The pig unit is gradually being expanded and a Large White gilt was donated to the College by Mr, C. G. Tracey. During the past year natural increase produced 33 baconers and 6 porkers.

Poultry

There has been an expansion in the poultry section and two laying houses and a battery house have been built. The laying flock has shown a rather high incidence of visceral lymphamatosis. To start the new season 363 unsexed day-old chicks were received on transfer from Gwebi Agricultural College. The hens will be reared for egg production and the cockerels as table birds.

Bees

An apiary section has been established and a bee-house built and fitted out. By the end of the year under review two of the hives were occupied.

THE ENGINEERING SECTION

As in past years, the Section has contributed, in very great measure, to the building development already reported, but it is fitting to pay tribute again to this co-operation between the sections, particularly in regard to the splendid achievements in the Tobacco Unit, and other projects, by the Engineering Section.

Further, it is pleasing to report that the Engineering Section now has a permanent 'home' for its activities, the workshop and offices having been completed in May 1963 and subsequently fitted out with tools, benches, etc. These additional practical and instructional facilities are being utilized to the full on five days a week, by the three courses now in residence.

In the course of the year's building development, the Section was responsible for installing additional water reticulation pipes and four drinking troughs, and also piping to the proposed orchard site.

A second-hand International Cub tractor was purchased for student instruction. It was completely dismantled and re-assembled by the students of Courses 1 and 2, and will be maintained in running order but subjected to further instructional 'duties', as and when required.

The most significant piece of equipment purchased during the year was a Massey-Ferguson front-end loader, with dirt bucket, and it has been extensively in use since it arrived. It will have a compost fork and hay sweep attachments made for it in the Section workshops, thus demonstrating to students why this implement has justified its place on almost every farm in more advanced countries.

EDUCATIONAL

The 1962/63 academic year commenced on the 1st October 1962 with the admittance of four students from Course 1 to the second year of the Diploma, and ten students enrolled for the first year of Course 2.

In July 1963, all 14 students sat the final examinations of their respective year and it is pleasing to report that the resulting examiners' meeting was satisfied that—

(a) All four Course 1 second-year students had qualified for entry to the third and final year of the Diploma; and

(b) Nine of the ten Course 2 first-year students qualified for entry to the second year, while the tenth was allowed to enrol in the second year, provided he satisfied the examiners in three first-year subjects at the end of the Michaelmas term.

N. E. Mumba, of Northern Rhodesia, was the best all-round student of the second year, while P. M. Pswarayi, of Southern Rhodesia, was awarded the 'Fertilizer Industry Bursary' for being the best all-round student in practical field husbandry of the first year.

At the end of the year it was known that the 1963/64 student intake would be as follows:

	Southern Rhodesia	*Northern Rhodesia*	*Bechuanaland P.*	*Totals*
Course 1	3	1	—	4
Course 2	5	5	—	10
Course 3	6	5	1	12
TOTALS	14	11	1	26

In view of the decision that Course 4 will commence on the 1st April 1964, a maximum of 14 students can be admitted and it can be reported that already applications have been received from 15 students for that course. It seems reasonable to assume, therefore, that the College will be operating to its planned capacity with the enrolment of Course 4.

In August 1963 two In-Service Training Short Courses were held at the College for Conservation Assistants of the Federal Department of Conservation and Extension.

REVENUE

Total revenue at the College during the year under review amounted to:

(a) Fees	£1,260
(b) All farm produce sales	£2,294
TOTAL	£3,554

GENERAL

The Principal was on vacation leave from the 1st May to the 31st August 1963. During this time Mr. A. R. T. Whitmarsh acted as Principal.

The College continued to attract many visitors during the year, while the staff attended meetings, and made visits, as often as the educational programme would permit.

ACKNOWLEDGEMENTS

I would like to express my appreciation of the efforts of all members of the staff and for their loyalty and hard work, often in the face of disappointment.

I would like as before to mention the close and friendly co-operation between this Department and the Department of Conservation and Extension, in particular and the efforts continuously made to ensure the most harmonious working of research and extension services. Co-operation with other departments, and indeed with other Ministries and even Governments is equally close and friendly even though, of necessity, it is more discontinuous.

B. S. ELLIS,
Director, Research and Specialist Services.

Department of Conservation and Extension Report for the Period 1st October, 1962, to 30th November, 1963

A. INTRODUCTION

A 'GOLDEN AGE' of Rhodesian Agriculture has come to an end with the dissolution of the Federation and it can only be hoped that a new period of prosperity will follow.

This report covers both the 1962/63 season and reviews briefly some of the progress made during the 'Federal Period'. For since 1955 in Southern Rhodesia and 1956 in Northern Rhodesia when European Agriculture became the responsibility of the Federal Ministry of Agriculture, the Department of Conservation and Extension has been developed to provide a service second to none in the world. The dissolution of this service will, for a while at least, have an effect on agricultural production in the two countries. While services are already being organized in Northern and Southern Rhodesia to take over the functions of the Department, it will take time to weld the staff together into teams as energetic and efficient as has been that of the Federal Department of Conservation and Extension, so widely known as 'Conex'. Neither will there be the same financial provisions to enable the planned expansion in the research work, special investigations and advisory services to be made. Nor can it be even contemplated that the very favourable field officer/farmer ratio which has prevailed up to now will be maintained, because henceforth fewer advisers will have to deal with a greatly increased number of landowners. Duplication of staff, equipment, investigations and research are inevitable in view of the tide of events. The story is a sad and disappointing one but that is for the future and this report must deal primarily with the past.

During the 1962/63 season the Department was able to function more or less normally despite the cloud of impending dissolution which hung over it and all credit is due to the spirit with which the officers carried out their duties when they were so uncertain of their future.

The progress in decentralization continued slowly as in the previous year and the authority of the Regional Officers was gradually increased. Programme planning was accepted by most of the Intensive Conservation Area Committees with very satisfactory results. The concept of community development, so long practised in the farming areas, was even further strengthened. The potential of the Natural Resources Board, the Intensive Conservation Area Committees and the Department of Conservation and Extension became even more powerful. What other team is so well organized to provide the driving force for increased production with the necessary safeguards for the natural resources of the country?

It is with considerable pride that the statistics of the Federal period can be examined in this report, for they give some indication of what has been achieved, especially if they are read in conjunction with the agricultural production and financial statistics of the Federation. But even more pleasure and satisfaction can be obtained when flying over the country, for it is on the ground that the progress is so clearly displayed.

B. GENERAL

B.1. *ORGANIZATION OF STAFF*

A considerable amount of extra work was given to the Directorate and the Administrative staff as a result of the transfer of duties, responsibilities, staff, movable assets and effects to the Territorial Governments.

The retirement on pension of Mr. R. H. Fitt, from the post of Regional Director, Northern Rhodesia, caused a number of staff changes. Dr. V. Vincent replaced Mr. Fitt; Mr. R. R. Graham replaced Dr. Vincent as Chief Planning and Training Officer and was given special duties in the Directorate.

The Head Office Records were gradually reorganized during the year with a new system being introduced so as to absorb the bulk of the Southern Rhodesia Ministry of Agriculture's Records. Additional staff was provided by the Public Service Commission and the Southern Rhodesia Government to carry out this task. The Records staff are to be highly complimented on the very efficient manner in which a considerable amount of work was done with literally no disruption of service or inconvenience to the remainder of the Department.

During the year 25 Field Officers resigned but this large loss was partly offset by an influx of new recruits at the beginning of 1963 — some 23 in all — leaving a net loss for the year of two, to which must be added the carry-over from the previous year, giving a total of 19 vacancies as at 30th September 1963. During the months of October and November there were two resignations.

During the year a Cotton Advisory Officer was seconded from the Department of Research and Specialist Services. His duties are to ensure that the Field Officers in the cotton-growing areas are kept fully informed of the latest methods and developments and to assist the Grain Marketing Board during the cotton grading season.

There were no new posts or upgradings authorized during the year.

Part of the Ministry's typing pool has been attached to the Department since February 1963, and this has considerably improved the efficiency of the service.

B.2. *VISITS TO OTHER COUNTRIES*

The Senior Conservation and Extension Officer visited the Cameroon Federation, Eastern Nigeria, the Ivory Coast and the Mali Republic in the course of a study tour of five weeks' duration in April/May on Community Development, organized by CCTA.

The Senior Conservation and Extension Officer and the Additional Regional Conservation and Extension Officer, Midlands, Messrs. J. C. Harper and A. J. Collett respectively, together with Research Officers, visited the Republic of South Africa, in February 1963, to study castor bean production methods and progress in sorghum breeding.

The Burley Tobacco Advisory Officer, Mr. J. W. Hayward, began a three-month tour of the Burley-growing areas of the United States and Canada and Italy to study methods of reaping, curing and preparation of Burley tobacco.

The Chief Tobacco Extension Officer, Mr. R. J. C. Hope, completed a study tour of the tobacco areas of the United States and Canada visiting more briefly the United Kingdom and Europe on his return.

The Farm Machinery Engineer, Mr. A. J. Spear, represented the Federal and Southern Rhodesian Governments at the third meeting of the CCTA Inter-African Committee on Mechanization of Agriculture in Lagos, at which he presented four technical papers.

The Regional Director, Northern Rhodesia, Dr. V. Vincent, attended the International Union for the Conservation of Nature and Natural Resources Conference in Nairobi, during September, as a delegate of the Federal Government.

Mr. P. R. Francis, Poultry Officer in Northern Rhodesia, participated as a lecturer in a poultry course at Entebbe in Uganda during the period April/May 1963. This course of instruction, designed especially for middle-grade African staff from various Government services in Africa, was held under the auspices of the Inter-African Bureau of Animal Health.

The Senior Work Study Adviser, Mr. B. W. R. Wilson, participated in a course on agricultural work study and economic farm management at Seale Hayne, Newton Abbot in the United Kingdom during the period October/December 1962. After the conclusion of the course he visited Sweden, Denmark, Holland, Western Germany and France for a few weeks and studied agricultural work study techniques at various centres in these countries.

Mr. L. H. Cruttenden, Animal Husbandry Extension Officer, visited certain centres in the Republic of South Africa during March 1963 to study various aspects of sheep husbandry.

The Burley Tobacco Advisory Officer, Mr. J. W. Hayward, through the co-operation of and with financial assistance provided by the Food and Agricultural Organization in Rome, spent approximately 11 weeks in Australia visiting places of agricultural interest.

The objects of Mr. Hayward's visit were, among others, to study methods of developing new areas, the land-tenure system, land-use planning and layout in relation to new areas, livestock production, veld and pasture management, certain aspects of dairying and the organization of the Australian extension service. This tour was undertaken while he occupied the post of Group Conservation and Extension Officer at Broken Hill.

Mr. J. E. Friedrichs, Animal Husbandry Advisory Officer, visited the Republic of South Africa in August 1963 on behalf of the Livestock Improvement Scheme Committee to purchase sheep for farmers in Rhodesia.

B.3. *REPRESENTATION ON COMMITTEES*

The Director and Deputy Director served on many committees during the year which are listed in the form of Appendix I to this report.

B.4. *PUBLICATIONS*

Officers of the Department wrote a number of articles for publication during the year, the more important of which are listed in Appendix II.

The *Rhodesia Agricultural Journal* (whose editorial committee's chairman is the Deputy Director), has been designed to fill a place between the purely scientific journals and the popular farming press. The advertising side of the publication was developed with the result that the journal is now on a far more economic footing than was the case in the past. If it is produced monthly there is no doubt that the publication could be self-supporting financially.

The introduction of the 'technical publications' has made it possible for more detailed and/or more scientific articles dealing with separate subjects to be brought together in a more attractive form. These will also provide an additional source of revenue.

C. SPECIALIST ADVISORY SERVICES

C.1. *PLANNING BRANCH*

a. LAND-USE PLANNING

Aerial Photography

The Southern Rhodesia Government's proposal for the systematic block-flying of the country every five years is of great benefit to the Department. During the year the whole of the area lying south of 19°30′S was flown at a scale of 1:25,000, covering an area of about 50,000 square miles. This provides new photography for practically the whole of the Matabeleland Region and half of the Midlands Region.

The suggestion of block flying was originally made by the Department as mentioned in last year's report.

Special Land-Use Assignments

The following special land-use investigations were carried out during the year for other departments and private organizations:

Natural Resources Board: A survey of the vegetation of mine dumps with regard to revegetation and erosion control measures.

The Agricultural Development Committee: Investigations into the potential of Southern Rhodesia, with particular reference to the agricultural and irrigation potential of the Lower Sabi/Lundi Catchment Scheme.

Veterinary Department: Investigations on Humani Ranch in respect of tsetse fly control.

Southern Rhodesia Land Development Corporation: To assess the potential of Central Estates.

Several other areas were also investigated, both on the ground and by means of aerial photography for special exercises for the Governments and private concerns.

Land Classification

The Planning Branch devoted a considerable amount of time to studying alternative methods of land classification and eventually alterations were made to methods of procedure used in the field. These modifications, including an auger grid system, give a more accurate soil classification and tend to reduce the time taken in the survey part of farm planning; moreover it enables soil classifications to be made throughout the year.

Vegetation Classification

Changes were also made in the methods of classifying the veld with particular regard to Ranch Planning. Officers of the Department of Research and Specialist Services assisted in these investigations.

Initial Development Planning

Procedure was also altered in the sphere of Initial Development Planning. The stereo-examination is now being carried out at Head Office, which helps to reduce the work of the Field Officer.

Farm Planning

The introduction of data sheets to cover all aspects of cattle management has reduced the time taken for the 'write-up' and has led to better advice being given in farm plans. Data sheets are now being prepared for other subjects.

The output of farm plans by the regions in Southern Rhodesia is as follows:

Region	*No. of Plans*	*Acres*
Mashonaland East	60	181,466
Mashonaland West	110	339,162
Midlands	25	385,247
Matabeleland	47	972,335
Eastern	26	78,016
Sabi Catchment Team	19	47,240
	287	2,003,466

The total number of farm and ranch plans completed in Southern Rhodesia since the inception of the Planning Branch now stands at 2,347, covering some 11,710,688 acres.

Catchment Planning

Due to the shortage of officers in the Sabi team the work of this unit was seriously curtailed. The major problem in the Sabi exercise is still the lack of progress in the African areas.

Regional Planning: *Northern Rhodesia*

Good progress was made and it is anticipated that the 'line-of-rail' plans will have been completed by the time the Territorial Government takes over. The Department will have more than fulfilled its aims and obligations to the North. (*See* Section E.9 of this report.)

b. WORK STUDY

Staff

With a full complement of staff, the work has progressed favourably. The Senior Work Study Officer attended a high-level course at Seale Hayne Agricultural College, England, and one of the Field Officers in a private tour visited centres in Australia and England where he was able to observe interesting developments in this general field.

Research

The existing data in the RTA Work Study Manual was checked and, as a result, modifications to the sections on fumigation and the Kurt reaping machine were issued. Further study of flue-cured tobacco handling concerned, specifically, the Barry reaping machine, grading off the stick, hanging tobacco on staples, loading on trailers, a damage survey on reaping machines, and sources and extent of breakage in handling.

Preliminary studies have been made on work study aspects relating to the production of cotton, groundnuts, maize and Burley tobacco. Turkish tobacco has been more closely investigated and a preliminary report is in preparation.

Advisory Work

A total of 1,047 visits were made to farms of which 66 per cent. were on request. Eighty-five discussion groups and field-days attended by 1,469 farmers were held. The quality of the discussions has greatly improved and the interest taken in them by farmers has grown markedly.

c. FARM MANAGEMENT

Advisory Work

Fifteen per cent. of the time of this Section was spent on advisory work to farmers, which included talks at 30 field-days, short courses, Intensive Conservation Areas and Farmers' Association meetings. Direct advice to individual farmers was limited. Some 23 per cent. of the time of the Senior Agricultural Economist was devoted to assisting and training the Department's field staff in this important aspect of work.

Research and Analysis

The results of analysis of farming operations for the full cropping year are available. As a preliminary to a survey of capital in ranch development a very detailed analysis of the developments of a single ranch over a nine-year period has been made.

C.2. *ENGINEERING*

a. Farm Buildings Section

Due to financial and other considerations, the farming industry has limited capital expenditure largely to those projects which can give substantial short-term returns and benefits.

Flue-Cured Tobacco

The impact of work study has been very noticeable in this field and has resulted in an increase of inquiries for advice on alterations, modifications and pre-planning of grading sheds in particular and leaf handling facilities in general.

A considerably increased acreage of tobacco will be grown in the coming season and although additional barn space is being provided it will be inadequate to cope with the additional crop anticipated.

Investigations into the development of multipurpose flue-cured tobacco buildings, in which both curing and handling facilities are incorporated, were continued. This is a field of considerable promise, particularly to new farmers with restricted capital. Investigations and observations are continuing.

Burley Tobacco

It is gratifying that the great increase in the interest in this crop has been accompanied by extensive inquiries for advice which, on being given, has been closely followed. This has resulted in a high standard of building giving excellent results under good management.

As a result of trials at Henderson Research Station and observations elsewhere some modifications have been made to the recommended design of Burley barns. These modified recommendations have been incorporated in a new bulletin and are being implemented in all new barns and in many existing ones.

Maize

Increasing interest is being shown in bulk storage and handling of maize and mechanized handling is attracting considerable attention.

Crop Drying

A prototype batch crop drier was developed and constructed at the Pig Industry Board Experiment Farm. Trials on a variety of crops have been most encouraging and, with minor modifications, further experiments will be carried out.

Special Buildings

Several buildings for new types of development were studied and designed by the staff and built by or under their guidance. These were a bee lecture and demonstration house at Henderson Research Station, a coffee fermentation plant at Chipinga Experiment Farm and cigar-wrapper tobacco barns and handling facilities for private enterprise on the Copperbelt.

Labour Housing

There has been a reduction of interest in the provision of housing for labourers, probably because it is a long-term investment with little short-term return. There is a considerable need for thorough and encompassing research into the requirements of and for such housing.

Industrial Development

In conjunction with industry a number of products were developed and improved and this is continuing. The interest being taken by industry in this field is pleasing to note.

General

Extension and development in the farm building field have become more difficult because the Farm Building Engineer devoted his attention to the production of a book on farm buildings, but once this has been published and he returns to normal field duties the section's work should be more effective than ever.

b. Farm Machinery Section

The past year has been a particularly fruitful one in highlighting a few of the more urgent problems which need immediate attention if the country's agricultural development is to progress and attain its full potential.

Training

Two pilot one-week courses in farm machinery were held in April for farmers and their assistants and for tractor drivers. The courses were sponsored by the Farm Mechanization Standing Committee who supplied the equipment and most of the instructors. They were most successful, and as soon as facilities become available it is intended to run courses as near continuously as possible for both the farming community and the Department's staff in order to improve standards of use and the care of farm machinery, thus increasing its economic life.

Development

There is considerable scope for development and modification of farm machinery to suit the country's needs over the whole range of equipment from initial tillage to harvesting. The establishment of a development centre would do much to improve equipment in Rhodesia.

Tillage

Limited investigations carried out during the year have clearly indicated that the standard of land preparation is a limiting factor in crop production. This can best be improved by the correct selection and use of tillage machinery. Unfortunately, the present knowledge of implements and methods suitable for Rhodesian soils, crops and rotations is totally inadequate for efficient production. It is necessary to determine by research the most suitable equipment and methods and standards of tillage to produce optimum crop yields.

Central African Ploughing Association

The support given by the Department to the Association has been most rewarding in the improvements in standards of ploughing generally which have resulted where matches have been held. A new class is being prepared for future matches to include contour maintenance as part of the ploughing operation.

A British university has offered its services to the Association to carry out research in problems of ploughing with mounted disc ploughs, and every assistance is being given by the Department in providing the necessary information about local soil conditions.

Groundnuts

The specially developed twin-row planters successfully planted over 1,000 acres on ridges. The technique for building beds about 5 ft. wide and planting four rows per bed with normal single-row planters has been successfully developed and several hundred acres were grown by this method.

Limited trials were carried out of an imported lifter-shaker which proved to be sound in principle but insufficiently robust for other than easy soils. Initial trials of a Rhodesian-designed universal sheller showed much promise, but further development is needed.

Maize

Interest in combine harvesting is increasing and several makes of machines were tried out under a wide range of conditions. There will probably be a considerable increase in combine harvesting next season.

Extension

Requests for assistance at field-days dealing with advice on land preparation, contour construction and maintenance, and preventive maintenance of machinery far exceed the ability of the staff to provide it even with group participation rather than demonstration.

c. Conservation Advice

Advice, guidance and instruction were given to Field Officers and others on dam siting, design, construction, maintenance and other problems, on erosion control and reclamation works and on road siting and drainage.

The ready assistance and co-operation received from the Ministry of Water Development and the Ministry of Roads and Road Traffic in mutual fields of work is much appreciated.

d. Research

(i) *Erosion Control Work at Henderson Research Station*

General Progress

Progress during the year was unspectacular but steady and satisfactory.

No new research projects were started but a great deal was done on the analysis and study of the results now available from nearly ten years of erosion control work. Consolidation and tying up of loose ends continued, and latterly the emphasis has been on recording in reports and publications as much as possible of the knowledge, data and experience gained during the life of the programme to date.

The Programme

There were no changes in the programme and normal recording of soil and water losses continued. Although the rainfall of the past season was the heaviest recorded since the experiments started, the results conformed to the pattern already established.

Rainfall Simulator

This is now working, but practical field testing continued. The results so far indicate that the design is satisfactory.

Fertility Losses

A further year's results were added, making this a five-year study. The data was put on punch cards and analysed by computer and the results have been so encouraging that it is hoped to apply this technique to all data.

Evapotranspiration Project

This again remained on a care-and-maintenance basis because of lack of personnel trained in the necessary disciplines to undertake this work.

(ii) *Other Projects*

Catchment Research

Several projects are being carried out or investigated in co-operation with the Hydrological Co-ordinating Committee. One additional measuring flume, designed so that automatic silt-sampling apparatus can be put in later, was installed on a minor catchment in the Sabi basin and further rain gauges were provided on the Matopos run-off experiments.

The Sabi Catchment Investigation Team was set up with the Senior Research Engineer as leader, to study and report on land-use and silt movement in the Sabi Catchment and on further long-term requirements for a full study of the problems involved. The short-term phase of the team's work is now nearing completion.

SARCCUS Committee on Erosion Research

The Research Engineer was appointed as a one-man Standing Committee of SARCCUS 'to lay down standard techniques for the conduct of small plot experiments for the measurement of run-off and erosion, to serve as an adviser and co-ordinator in regard to research and experimentation on run-off and erosion, and to be recognized as an official SARCCUS consultant in this connexion, available to advise Member Governments'. Proposals for standardization and co-ordination were drawn up and circulated to all member governments and the replies will be used to prepare a report to SARCCUS.

Advisory Experiments (Regional)

The run-off experiments in Odzi, Marandellas West and Wenimbi Intensive Conservation Areas were continued unchanged and have one more season to run to complete the planned cycle of five years. The gully control experiments in the Bembezaan Intensive Conservation Area have been written up but will continue as a demonstration and to determine long-term effects. Equipment was installed on Devuli Ranch in the Sabi Valley Intensive Conservation Area to measure the erosion near dips and watering points but no results are available as yet.

Advisory Experiments (Other)

Advice and guidance continued to be given to the officials responsible for the experiments at Mimosa Tea Research Station and Njuli Research Station in Nyasaland. Interesting and valuable results are beginning to appear and further installations were effected to extend the scope of the work.

(iii) *Drainage Research*

As was the case last year, the main emphasis has again been upon the further development of a limited number of experimental sites. After several years of extensive trials on many soils and sites throughout the country, the object is now an intensive study at a few selected sites. Comprehensive experiments with a great deal of recording apparatus and instruments have now been installed at Grasslands Research Station on granite sand, and at Thorn Park Estate on heavy clay soil.

Practical farm scale schemes were also installed on farms at Rusape and Odzi, and cropping trials were carried out on several sites. The results of exploratory trials with soya beans, wheat, oats, barley, lucerne and groundnuts are all sufficiently encouraging to warrant a vigorous extension of this part of the programme.

The present position can be summarized by saying that, generally, it is now known how wet lands can be efficiently drained. The long-term studies already in hand must continue to find out more about both the effects of drainage and the nature of water movement in wet lands, but the tremendous potential of drainage is clearly apparent, and the problem of how to make the most effective use of drained land requires urgent attention.

C.3. *TOBACCO BRANCH*

Tobbaco-trained officers made 9,497 visits of various kinds during the year and of these 8,202 were to farms.

a. TRAINING

Twelve officers, including one from the Northern Rhodesian Department of Agriculture, completed their in-service tobacco training and two their farm training during the 1962/63 period. Twenty officers, including one from the Department of Research and Specialist Services, are undergoing in-service training in 1963/64—a system of training that has proved very satisfactory. No officers have been placed on farms this season.

An in-service course on Turkish tobacco was held in Bulawayo and a Burley course for farmers at the University College of Rhodesia and Nyasaland. Two courses for flue-cured tobacco growers were held at Kutsaga in October 1963. All of these were most successful.

b. COMMERCIAL GRADING SHEDS

Officers from the Department inspected sheds when requested by either the South-Western or North-Eastern Tobacco Marketing Boards. Powers of inspection have now been limited to the Specialist Officers.

c. AGRICULTURAL SHOWS

Flue-cured tobacco was judged at the Macheke and Fort Victoria Agricultural shows. Burley exhibits at Salisbury and Lusaka were judged by the Chief Tobacco Extension Officer and Burley Tobacco Extension Officer respectively.

d. TOBACCO RESEARCH BOARD

Liaison with the Tobacco Research Board was maintained and improved.

The Department assisted with preparations for the annual farmers' meetings held by the Board's staff at various centres in the two Territories and attended the annual planning conferences on flue-cured, Burley and Turkish tobacco. Various officers trained in tobacco helped the Board by spending a week on duty at Kutsaga to answer farmers' queries.

e. FIELD TRIALS

Twenty off-station tobacco trials were run on farms in conjunction with the Tobacco Research Board. Of these 18 were brought to a successful conclusion.

f. RHODESIA TOBACCO ASSOCIATION

Councillors in Northern and Southern Rhodesia were visited when possible to maintain liaison between the Department's field staff and the Association.

g. SOUTH-WESTERN TOBACCO MARKETING BOARD

The Chief Tobacco Extension Officer, or his representative, attended all meetings of this body.

A limited number of classification courses for farmers were held by the Board's staff which proved very popular. This type of instruction will be increased now that the organization has appointed a Grading Adviser.

h. TOBACCO EXPORT PROMOTION COUNCIL OF RHODESIA AND NYASALAND

A close liaison was maintained with the Council.

i. TOBACCO TRADE ASSOCIATION

Monthly reports of the Branch are circulated to members of the Association during the growing season. There is no other direct liaison with this body.

j. CENTRAL AFRICAN TURKISH TOBACCO ASSOCIATION

Close liaison continued with the Association. Mr. Pavlovitch worked with the Department's staff and assisted with the training programme on leaf-quality aspects.

The Senior Tobacco Extension Officer serves on the Council of the Association as a co-opted member for Northern Rhodesia and the Turkish Tobacco Extension Officer attends Council meetings by invitation.

k. BURLEY TOBACCO GROWERS' ASSOCIATION

Formation of the Association replaced the committee set up by the Department to handle the affairs of producers in the first year.

The Chief Tobacco Extension Officer and the Burley Tobacco Extension Officer attended meetings of the Association.

l. VISITORS TO THE FEDERATION

Members of the Branch attended the CORESTA and Tobacco Trade Congresses held in Salisbury. Arrangements were made for delegates to visit tobacco farms to see Rhodesian production methods.

A study tour was arranged for Mr. Jackic of Yugoslavia who visited this country on a United Nations scholarship.

C.4. *PEST AND WEED CONTROL SERVICE*

a. INSPECTIONS

Officers of the Pest and Weed Control Branch carried out 6,096 inspections during the year, in terms of the Plant Pests and Diseases and Noxious Weeds Acts. Of these 1,555 were concerned specifically with noxious weed control.

The tobacco tranship sheds and private tobacco storage sheds in Beira were inspected monthly during the year at the request of the Tobacco Trade Association. On each occasion the cleanliness and insecticidal treatment of all the sheds were found to be of a suitably high standard. A vacuum fumigation plant installed at Beira at the request of merchants in March 1963, for the fumigation of tobacco intended for export, has been operating satisfactorily.

b. PROSECUTIONS

Eighteen prosecutions were made against farmers who had failed to comply with the requirements of the Plant, Pests and Diseases (Tobacco) Regulations.

c. MINOR IRREGULARITIES

In addition to the above-mentioned prosecutions there were a number of minor contraventions of the regulations. Most of these concerned the presence of small numbers of volunteer or regrowth tobacco plants in lands and seed-beds after the fixed dates, and the failure to clean out thoroughly all tobacco scrap from farm buildings and limewash tobacco storage-rooms as required by law.

d. PESTS

Infestations by the cigarette beetle *Lasioderma serricorne* were found on 28 occasions in the premises of certain merchants. In all these cases fumigation of the tobacco and in one case of rice bran, and insecticidal treatment of the premises concerned were carried out satisfactorily.

e. NOXIOUS WEEDS

The heavy infestation by *Eichornia crassipes* of the Makabusi River, which existed in the 1962/63 summer, was cleared by the National Parks Department through the judicious use of 2.4-D sprays in the autumn.

Work on the eradication of *Eichornia crassipes* from other infested rivers and certain farm dams has been continuous since the last Annual Report was written

Continuous clearing of *Salvinia auriculata* from the Chimedza River and dams on Harleigh, Glentarg, Drift Land, Virginia 'A', Shemara, Valleyfields and Riverdene farms was also undertaken by the property owners concerned. This aquatic weed has not been seen in the Prince Edward Dam since its eradication there by the Salisbury Municipality in 1962.

In all areas, efforts have been and are being made to destroy *Lantana camara*. As in Northern Rhodesia, most town management boards, municipalities and local authorities in Southern Rhodesia have introduced by-laws for their areas, in terms of the Noxious Weeds Act, compelling landowners within their respective areas to eradicate this weed from their properties. Progress, however, is slow because of the heavy cost involved in certain cases where the degree of infestation is high.

C.5. *IRRIGATION DEVELOPMENT*

a. General Progress of Irrigation

Farmers' interest in irrigation still continues. There is a steady increase in the acreage irrigated and in the irrigation rights applied for in both Northern and Southern Rhodesia. The actual area which is irrigated varies from year to year, depending on the season and the amount of water available. A good rainy season will result in a decrease in summer supplementary irrigation but will reflect a greater acreage for winter irrigation. The downward trend over the last few years of supplementary irrigation might now slow up because of the satisfactory results which were obtained this season in maize and tobacco. In both Northern and Southern Rhodesia there has been a welcome increase in wheat acreages and the very good results which are expected should see a further increase next year.

The main irrigation development in the Federation is taking place below the Kyle and Bangala dams where expansion of sugar-cane plantings has received a boost owing to recent world shortages and poor sugar-beet crops in Europe. Another very good reason for expansion are the high yields which are being obtained.

In the drier areas of Southern Rhodesia lucerne continued to be grown and is increasing in some areas. Good returns are also being obtained in Northern Rhodesia. More farmers are interested in lucerne-meal production, and in Northern Rhodesia the Industrial Development Corporation is very active in attempting to promote this commodity.

Cotton is becoming more popular as a crop which can benefit from supplementary irrigation and fairly good results are being obtained in various parts of the country. In view of the benefits which can be obtained from early plantings the acreage under irrigated cotton should expand.

Very satisfactory progress is being made with the newer methods of irrigation. Numerous demonstrations throughout the country have proved valuable. On the whole these improvements in layouts are giving better and more even water applications and are more economical in labour and water in their operation.

The approximate acreage under irrigation in the country is 66,000, of which 23,500 acres are under sugar-cane; this latter figure is expanding rapidly.

b. Extension Services

Throughout the year the Irrigation Officers gave valuable advice and aid to both farmers and field staff of the Department in all aspects of irrigation farming—irrigation layouts, economic assessment of schemes, watering frequencies, etc. Numerous field-days and discussion groups were attended and talks were given to Intensive Conservation Area Committees.

Because of the very rapid expansion of irrigation in the lowveld, a Conservation Officer was recently stationed at Triangle and Hippo Valley to concentrate largely on irrigation matters and to collect data about crops and methods of irrigation on the soils that are to be found there. During the year a co-ordinating committee, the Lowveld Research Advisory Committee, consisting of Government officials and representatives of the two companies, and others, was set up to co-ordinate research. This committee will be able to play a very important part in the orderly progress of irrigation in the lowveld.

C.6. *APICULTURE*

a. General

Due to the efforts of the Apiculturist a tremendous interest in beekeeping as been engendered in the country at large among people in all walks of life and the sale of beekeeping equipment and appliances by commercial suppliers has soared. Over 1,300 hives were sold during the year by Salisbury merchants engaged in this trade and many beehouses were built. There are now approximately 300 of the latter in the two Rhodesias.

The Apiculturist was hard put to cope with the never-ending demand for her services. She spent 200 days away from her base and gave 55 lectures to Young Farmers' Clubs and other institutions as well as over 200 demonstrations and film/slide shows to interested groups of beekeepers.

Completion of a specially equipped beehouse on Henderson Research Station at the end of July represents a marked step forward in that it has brought into existence adequate facilities for training extension workers and others in the principles of beekeeping. It has already been put to good use for this purpose, four short courses having been completed there since that time for officers of this Department and the Southern Rhodesia Ministry of Agriculture. A representative each of the Northern Rhodesia Department of Forestry and the Southern Rhodesia Forestry Commission also attended one of these courses.

Of significance is the fact that many new beekeepers' associations came into being during the year as well as a National Council, on which central body all these associations are represented.

b. Problems Confronting the Beekeeping Industry

Absconding swarms remain the most important problem confronting beekeepers in this country. It is unlikely that a solution to it will be found until research work on this phenomenon is instituted.

Another problem that is rapidly developing is the speed with which people with very little theoretical knowledge and the minimum of relevant practical experience are venturing into beekeeping. Despite advice, these enthusiasts are developing their apiaries too quickly in relation to their skill and run the distinct risk of making errors of management which could well prove to be expensive.

The lack of a trained, full-time beekeeper to assist the Apiculturist is a handicap which promises to make itself felt with increasing acuteness as time advance. The great need at present is to teach those members of the Department of Conservation and Extension who have a flair for beekeeping, the rudiments of this knowledge so that they can ease the work-load the Apiculturist is called upon to carry.

c. Future of the Beekeeping Industry in Rhodesia

Events of the past year have merely confirmed what was written in the last Annual Report regarding the potential that exists in the two Rhodesias for honey and beeswax production. This potential is very great and, if carefully developed, should prove highly profitable to those who venture into this field.

C.7. *TRAINING BRANCH*

The progress in this Branch is best illustrated by the following comparison of the 1962 and 1963 training programmes, and the enrolment for the forthcoming 1963/64 programme.

Programme	*No. of Courses*	*Enrolment*		
Year	*(excluding YFC)*	*Conex*	*Other Depts.*	*Total*
1961-62	44	422	76	498
1962-63	47	483	91	574
1963-64	62	579	308	887

The value and standard of training may be indicated by the fact that, in spite of uncertainties relating to the dissolution of the Federation, enrolment for 1963/64 courses has not only increased by over 300, but also enrolment for voluntary courses equals that for obligatory courses. Enrolment from external departments and public bodies has increased more than three-fold.

In youth extension also the Young Farmers' Club Association (YFC) has moved from depression and frustration a year ago to a spirit of hope and progress today. It is to be hoped that Territorial Governments, by their enlightened administration and personal relations with staff, will enable this progress to continue.

Appendix VIII shows what the Department has achieved in the field of training.

D. SOUTHERN RHODESIA

D.1. *ORGANIZATION AND STAFF*

Mr. T. E. de la Hunt replaced Mr. Graham as Regional Conservation and Extension Officer, Mashonaland East. There were numerous other changes of staff during the year.

The Vuti Unreserved Land Settlement Scheme was finally declared an Intensive Conservation Area during the year (21st June 1963), as was the Tengwe area (26th October 1962), bringing the number of Intensive Conservation Areas administered in Southern Rhodesia by the Department to 99.

Certain changes with regard to the areas covered by the Group Officers were effected to provide improved advisory services to the farmers in the areas of the Eastern Region which required more intensive tobacco advice.

Minor changes in Intensive Conservation Area boundaries were also made.

As mentioned previously, the programme planning approach is helping to draw Intensive Conservation Area committees yet further into the self-help production programme and the team spirit has been strengthened in most areas.

A complete list of Intensive Conservation Areas is given in Appendix III of this report.

D.2. *GENERAL AGRICULTURE, CROP AND LIVESTOCK INFORMATION*

a. WEATHER CONDITIONS

The 1962/63 summer was an unusual one in that excellent and widespread rains started to fall in most areas from the middle of November, continuing without respite, except in Matabeleland where a dry spell was experienced in early December, until the New Year. Rains recommenced at the beginning of February, and fell copiously and for fairly long periods well into March before tailing off in April.

Long periods of overcast weather and extremely wet conditions can thus be said to have characterized the 1962/63 season which was not an easy one, in consequence, for farmers in the cropping areas. Ranchers in Matabeleland, on the contrary, welcomed the rainfall distribution pattern which was very favourable for stockmen—especially so in view of isolated torrential falls of up to 4 in., which alleviated the surface water position in certain parts of the Matabeleland lowveld during May and July.

The winter was an abnormally long and cold one and heavy frosts were experienced in many areas, which damaged late-maturing cotton and early tobacco seed-beds in the western part of Mashonaland and irrigated vegetable crops in the Matabeleland lowveld. The losses sustained by vegetable producers in the latter area through this cause amounted to thousands of pounds sterling.

b. CROP PRODUCTION

FOOD CROPS

Maize

Due to the prolonged wet spell lasting from the middle of November to the end of December, many farmers found it impossible not only to plant all their planned acreage in the former month, but also to cultivate that maize which they were able to establish. Indeed it may be said that poor weed control, brought about by unfavourable weather conditions, constituted the largest problem maize producers had to face during 1962/63. Because of this difficulty the average level of yield in most of the higher rainfall areas was in the vicinity of only 12 to 13 bags per acre.

A few farmers who planted the major portion of their crop by hand and had slightly less rain than the majority, were at a great advantage over those who machine planted only. They were able to complete their planting in November instead of later in the season, but even they were hard put to keep weeds under control.

In one or two areas such as Que Que and Matabeleland where supplementary irrigation was done, exceedingly good yields of between 50 and 60 bags per acre were produced.

The single hybrid 59H17 (SRH 52) yielded consistently well where conditions were reasonably favourable and it will undoubtedly be grown on an increasingly larger scale in the future. Its high cost of £9 10s. per 100-lb. pocket did not appear to deter maize growers from using this hybrid; rather it influenced the farmers concerned to provide a high standard of crop husbandry where SRH 52 was grown.

Disease incidence was comparatively low, but pests such as stalk borer were a problem on many farms—invariably where the simple, recommended application of 2½ per cent. DDT was not applied. There is no doubt that insufficient attention is being paid, even by progressive farmers, to the need for controlling this particular pest.

Sorghums

Considerably increased acreages of this crop were grown in the Que Que, Gwelo and Victoria areas over those that were established in 1961/62 but yields varied greatly from 2 to 16 bags, with an average of approximately 9 to 10 bags per acre. Heavy bird damage in the Midlands drastically reduced yields on many farms. Approximately 1,400 acres were planted to this crop in Matabeleland where, despite excessively wet conditions during the early part of the season, good yields were obtained. The only other area in which a reasonably large acreage of sorghums was grown was in the vicinity of Odzi and Cashel. Average yields obtained in this part of the country were in the vicinity of five bags per acre.

There is great scope for this crop in the lower-rainfall parts of the country provided that the Quelea menace can be overcome satisfactorily. The potential of a high-yielding hybrid such as NK 300 for grain production has already been demonstrated, but farmers are loath to increase their plantings of this or any other sorghum because of the depredations of birds. An answer to this problem might well lie in a concerted effort being made by the Department of Wild Life Conservation to eradicate nesting colonies of Queleas in Matabeleland and the Midlands.

Groundnuts

An intensive propaganda campaign and extension effort in 1961 and 1962 resulted in a fairly large acreage of groundnuts being established in most of the main cropping areas during this last season. Had the excessively wet conditions of the summer not occurred, there is no doubt that a heavy crop would have been reaped; as it happened, yields were disappointing except in the Barwick Intensive Conservation Area and in the Umfuli, Que Que and Gwelo areas, where an average of about six bags per acre of shelled nuts was reaped. Certain parts of Matabeleland also enjoyed satisfactory yields.

The overall results in the Mashonaland and Eastern Regions were decidedly disappointing, but despite this fact, farmers generally have not lost interest in the crop—except, perhaps, in the Mashonaland East Region where, it is anticipated, a reduced acreage will be planted in 1963/64.

In the country at large there will probably be an unspectacular but steady increase in the acreage planted to groundnuts over the next few years and, concomitant with this development, there will be far greater use made of lifting and picking machinery than there is at present. Already farmers are aware of the need to mechanize their operations where groundnut handling is concerned. Some of the more progressive growers who have faith in this crop have already set about acquiring certain of the equipment that they need for this purpose.

Potatoes

Prolonged heavy rains adversely affected summer-grown crops in the Eastern Region as well as in the Enterprise/Arcturus area and poor tuber moth control in the Gwelo area during a dry spell reduced the yields of what had, earlier in the season, been promising stands of potatoes.

Irrigated winter crops in all areas gave fair to good yields, depending upon the incidence of frost experienced. Growers in the Limpopo Valley and in the Umzingwane area suffered severe losses due to heavy frosts in July and August.

Seed potato production in the higher lying areas of the Eastern Districts expanded during the year but, unfortunately, because of poor distribution and an apparent lack of liaison with the appropriate authorities in regard to import control, considerable amounts of locally grown certified seed were not placed. This represented a substantial loss to some growers.

Promulgation of regulations forbidding the growing of potatoes and tobacco on the same farm during the summer was an attempt made by Government during the year to reduce the risk of infecting tobacco with tobacco vein-browning virus. Exemptions were granted to farmers who were already committed to the production of these two crops but a stipulation was made that a minimum distance of 440 yards should separate them.

Wheat

Increasing interest is being shown in winter wheat production in areas where irrigation facilities and suitable soils exist as in certain parts of the Featherstone Intensive Conservation Area, the Umfuli and Victoria Groups and the Glendale Intensive Conservation Area. Good crops of varieties such as Mazoe, Marodzi and Kafue have been grown in all these areas and have yielded extremely well, except where frost damage was experienced—as in the Charter Group.

The potential for winter wheat production in this country is considerable and this is especially true now that high-yielding varieties have been bred which have a pronounced degree of resistance to the four local races of rust. Aside from the ease with which it can be mechanized and the assured market it enjoys, the crop is an attractive one to grow from the economic aspect, provided that yields in the vicinity of 18 to 20 bags per acre are obtained.

Very little summer wheat was grown in 1962/63 and that which was produced gave indifferent yields, due to weed competition. The prospects for this type of production are not bright. If weed control trials, soon to be carried out in summer wheat, prove to be successful, the position might well change. The overall level of yield, however, even with effective weed control, will always be lower in the case of the summer-grown crop than that produced in the cool period of the year.

Soya beans

Results achieved during the past season were extremely disappointing, yields on the average being about three to four bags of grain per acre. A few crops yielded as high as nine, but these were exceptions. The most important reason for this poor performance can be directly attributed to the unusually wet conditions and prolonged periods of overcast weather which prevailed during the summer. Many farmers planted their crops far later than they should have done to obtain optimum yields and were prevented by weather conditions from keeping weeds under control. Some farmers simply did not give the crop the attention they should — and could — have devoted to it.

Soya beans undoubtedly have an excellent future in Rhodesia and, at a yield level of ten bags of grain per acre, are much more economic to grow than a 20-bag per acre maize crop.

Sunflowers

Sunflower crops stood up remarkably well to the prolonged rains of the season and the very wet conditions that these brought about. Yields, however, were not higher than about six to seven bags of grain to the acre in most instances.

On many farms where this crop was grown, heads were milled for inclusion in livestock rations.

Because of the fact that it is known to be a great host of eelworm, sunflowers will never be an important crop in the sandveld areas where tobacco is grown. There is a definite place for it on the heavier, more fertile soils provided that the rotation is carefully controlled and good yields are obtained.

Edible Beans

Although there is an excellent potential for this crop as an income earner and/or as a source of protein for labourer rations on the farm, it rarely commands the degree of attention necessary for its successful production. Invariably it seems to be planted much too late, as happened in the Umshandige area during this past year, and in many cases is not cultivated sufficiently.

Yields during the season varied from two to four bags per acre.

Deciduous Fruit

The standard of production of deciduous fruit in the Eastern Districts has continued to rise steadily, particularly under irrigation. Mulching and scrupulous weed control has helped the dry-land orchards, but it is doubtful if they will be able to hold their own with the inevitable price competition which will accompany a large build-up in the market caused by big estates that are just coming into production.

The need for increased variety trials on a national basis is an urgent one which must be satisfied if the industry is to continue to progress.

Citrus and Sub-Tropical Fruit

Except for home gardens and small farm orchards citrus plantings do not appear to have increased substantially — the one notable exception being a large commercial organization in the Mazoe Valley which is at present doubling its already vast acreage under trees.

Export of avocadoes from Southern Rhodesia to Covent Garden during the year has greatly stimulated interest among Eastern Districts growers in the potential of this crop.

Import restrictions brought into being this year should result in an expansion of the banana crop and the satisfaction of local requirements of this fruit in the not-too-distant future.

Vegetables

The main vegetable-producing area of the country, the Eastern Districts, did not have too successful a year because of heavy summer rains and severe winter frosts. Nevertheless, some good crops were produced, notably tomatoes in the frost-free areas of Cashel and cabbages reaped for dehydration in July.

Some producers in the Limpopo Valley have reduced their acreages of vegetables because of the high cost of transporting the fresh product to market, and are proposing to venture into cotton and citrus production instead.

CASH CROPS

Tobacco

Flue-Cured

(i) *Seedbeds*

The majority of growers had adequate supplies of good, hardened seedlings available for water planting. Poor watering techniques on some farms and severe and widespread cutworm damage in the Umvukwes and in parts of Karoi resulted in patchy beds. Generally the incidence of disease and attack by other types of insects was low.

It is evident that far too many growers are still not fumigating their seedbeds.

(ii) *Land Selection and Preparation*

The usual problems were encountered with late ploughing and following the onset of continuous rains, final preparation of some of the heavier soils became impossible. Fertilizer applications remained much the same as in the previous season, with an increasing use being made of lime.

More thought is being given to the choice of suitable soils for tobacco growing but there is still room for considerable improvement in land preparation — particularly in initial ploughing.

(iii) *Crop Management*

The crop was planted out 10 to 14 days later in the season than was the case in 1961/62. Plantings made between mid-November and mid-December were adversely affected by the wet, overcast conditions — particularly by the lack of sunshine, and growth was slow. The dry spell in January helped to improve the crop potential generally but the same plantings to which reference has been made, due to lack of root development, did not recover as well as the earlier and later plantings. There were many cases of early flowering combined with low leaf number, and various treatments were applied to try and correct this with equally varying results.

Top dressings with nitrogen proved to be a bone of contention and the tobacco crops of many who applied this nutrient, regardless of possible results, showed adverse effects when the weather improved.

Weeds were difficult to control, but in the main, farmers managed to keep their lands clean. In the majority of cases topping and the standard of suckering were satisfactory.

(iv) *Reaping and Curing*

Weather conditions delayed the start of reaping and curing. Much of the earlier-cured leaf was clean and bright and there was a tendency to reap on the green side, probably due to false ripening. There were few curing problems.

The use of the string-hanging method of curing increased significantly and it is likely that this trend will continue.

(v) *Storage*

No major problems were experienced with any of the systems of storage employed.

(vi) *Grading, Baling and Preparation for Sale*

Increased use was made of work study methods to improve grading output and more attention was paid to type grading. Some trouble was experienced in controlling over-conditioning during periods of high humidity.

Baling and presentation were generally of a high standard.

(vii) *Pests and Diseases*

Angular spot and alternaria caused widespread damage during February, especially where crops greened up drastically due to top dressings of nitrogen. Other diseases caused little trouble.

Insect damage was mainly caused by leaf miner, budworm and cutworm attacks.

(viii) *Buildings*

Additional barns were constructed mainly in the northern Mashonaland areas and additions were also made to other handling facilities.

If the total acreage planted in 1962/63 is maintained or increased without provision of more barns and storage facilities, serious losses of leaf and leaf quality are likely to occur during the 1963/64 season.

(ix) *General*

The following figures reveal the magnitude of the 1962/63 crop handled by the South-Western Tobacco Marketing Board, and the figure for which it was sold.

Acreage planted	245,000
Weight sold	194,782,358 lb.
Value	£33,779,605 3s. 4d.
Average price	41.62d./lb.
Average yield	795lb./acre.

Turkish

Seed-beds presented very few problems and lands were well prepared. In spite of extremely adverse weather conditions, early planted crops in the higher-rainfall areas gave satisfactory returns to growers. Good yields were also achieved in the lower-rainfall areas — especially in the case of December plantings.

Leaf types were kept well separated and the standards of baling and presentation were excellent.

Because of the lack of a regulatory marketing organization the statistics of production relating separately to Southern and Northern Rhodesia are not available. The total crop for the whole Federation, of approximately 1¼ million lb., was sold for an average price of about 41d. per lb.

Burley

The acreage established to this crop increased with a wide spread of production into many different areas. Few problems were encountered in seedling production but difficulties were experienced in establishing the crop on some of the later-ploughed heavy soils, due to prolonged wet conditions.

In general, the crop grew very well in the Midlands but climatic conditions in Mashonaland gave more variable crops. There was little disease damage although budworm and leaf miner were particularly troublesome in isolated cases.

The primed leaf cured well with some cases of premature drying being experienced due to the dry spell in January. Stalk cut cures presented some difficulties because of the high humidity conditions that obtained in February and in a number of cases moulding of leaf occurred. The main problem was shortage of adequate handling facilities.

It was apparent on the floors that much of what had been an excellent crop in the lands was spoilt to varying degrees in the handling process; there is room for considerable improvement in this sphere.

The season's production amounted to about one million lb. weight, which was sold for approximately 26d. per lb. Considerable acreage increases are expected in 1963/64, especially in the Gatooma, Hartley and Triangle lowveld areas.

Cotton

The adoption by growers of spray recommendations issued by the Gatooma Research Station, and use of the new tailboom developed there, have profoundly changed the outlook in regard to cotton production in the two Rhodesias. A contributory factory of great importance has been the appointment by Government of a Cotton Advisory Officer who commenced duty with the Department of Conservation and Extension on the 2nd January 1963. This officer is on secondment from the Department of Research and Specialist Services.

Because the first good widespread rains fell only in the middle of November, most growers planted seven to ten days later than usual during this last season. Despite this fact and the heavy prolonged rains which fell from the middle of November until late December and again in February, overall yields were excellent, averaging 1,254 lb. per acre in the European farming areas of Southern

Rhodesia. The area that was planted to cotton by European growers in the territory was 5,581 acres and the weight of seed-cotton produced by them amounted to 6,996,000 lb.

Interesting facts that have emerged from the 1962/63 season are those relating to the greatly increased yields which have been obtained as a result of the application of adequate fertilizer dressings. This information has already been made known to farmers who intend to grow cotton during this coming summer and will undoubtedly have a most beneficial effect on future yields. Another point that has impressed itself on growers' minds is the havoc that can be wrought by severe frosts, such as were experienced in Doma, Raffingora, Bindura, parts of the Glendale District and west of Hartley. Great damage was done to the upper bolls of crops in these areas. It is obvious that frost hazard must be taken into account when selecting land for cotton.

According to the most up-to-date information available, it is likely that farmers who produced cotton during 1962/63 will increase their plantings by 50 per cent. in the 1963/64 season and that 50 new growers will enter the scene, each with about 40 acres. The total acreage that it is anticipated will be established to cotton in Southern Rhodesia during 1963/64 is 10,400.

Horticultural and Crop Seeds

Little, if any, expansion in seed production took place during the period covered by this report — despite the fact that climatic conditions in the Territory favour this line of agricultural endeavour. Seed-maize continued to be the crop most widely grown for seed purposes in Mashonaland. Other crops grown for seed by producers in this general field were peas, beans, cauliflowers and lettuce.

Standards of production are slowly improving.

Sugar-cane

The average yield of 60 tons per acre achieved on Triangle Estate during this past year was the third highest in the world and represented a great achievement for the sugar industry in Rhodesia. Overall, the season can be said to have been a favourable one for producers — despite severe winter frosts in the Victoria lowveld which damaged 2,000 acres of cane. New settlers in the Hippo Valley area did exceptionally well.

Tea

An active planting programme is still under way in the Eastern Districts where all the country's tea plantations are concentrated.

Individual farmers in suitable areas along the eastern border are being encouraged to plant tea for ultimate delivery to the central factory of one of the companies engaged in this type of production.

Coffee

Following the appointment by Government of a Coffee Specialist in the Eastern Region early in 1963, a great fillip has been given to the small coffee industry which is in the process of being developed in the Eastern Highlands.

Close attention was paid to more thorough weeding and mulching, although the timing of these operations was too late to be of immediate benefit. Next year's crop will show the value of this work.

Low temperatures during the harvesting and processing season caused difficulties with fermentation but did not result in any apparent loss of quality. Reports that were received on early samples referred to good raw appearance and roast and disappointing liquor and quoted an average classification slightly above the Kenya grade F.A.Q.; this gives a present market value of over £300 per ton 'A' grade.

The latest estimate of acreage, published by the Coffee Growers' Association, shows 542 acres already planted and an early prospect of 1,175 acres being established to coffee in this particular part of Rhodesia.

Fodder Crops

Maize was grown extensively as a silage crop during this past season, either alone or in conjunction with legumes such as velvet beans and dolichos. In addition to its use in silage manufacture and grain production, maize was used by a number of farmers in the Eastern Region as a green fodder, being planted under irrigation to a density of about 100,000 plants per acre. Lucerne held its own on the heavier, well-drained soils under irrigation as the fodder crop par excellence. Soyas, jackbean, dhal, *Desmodium intortum* and *D. discolor* were some of the other legumes grown as fodder by farmers during the year — the two latter primarily in Mashonaland and on a comparatively small scale. Sunflowers played only a moderately important role in silage and hay manufacture, most farmers finding it more convenient to mill the heads as an addition to livestock rations.

All the crops that have been mentioned did moderately well on those farms where weed control was effective. Prolonged spells of wet weather slowed down the rate of growth in most areas, however, and final yield levels were lower than they might have otherwise been.

c. LIVESTOCK

BEEF CATTLE

Heavy and prolonged rains prevented stock making good summer gains during the wetter months of 1962/63 in the drier areas of the country. Late rains and good water supplies resulted in better-than-average performance for the season on the whole. In the higher-rainfall areas, however, the long, cold, wet spells resulted in such poor summer gains that the extension of the season with late rains did not fully compensate for the earlier setback. As a result cows did not come through winter well and it is feared that this will be reflected in disappointing conception rates in the coming bulling season. Though slaughter weights were good in the lower-rainfall areas, they were poor in the rest of the country. Losses from poverty were experienced during the winter and this was associated with overstocking and heavy internal parasite infestation.

In the course of their work officers of this Department have laid particular stress on the importance of correct stocking and the need to ensure that, by light summer stocking, the best possible gains are made in summer. The most critical months are November, December and January, when cattle are often forced to eat down paddocks to 'tame' the veld and in consequence fail to gain as well as they should. Were the best summer gains to be made, the need for supplementary feeding in winter would be less and the cost consequently lower.

MANAGEMENT

Throughout the tobacco areas where returns have been disappointing, there has been a very considerable change in the standard of management of beef cattle herds, farmers looking more and more to their cattle for another source of income. Extension work on cattle has been stepped up in these areas and the response from farmers in the form of their attendance at courses and discussion groups, has been very gratifying. Many farmers have adopted the system of purchasing weaners, especially on the smaller farms, thereby specializing in one form of production to simplify management problems. The Cold Storage Commission weaner/grazer agreement scheme has greatly assisted in overcoming difficulties in finance. There can be little doubt that there is tremendous potential for expansion of cattle production through stocking of farms in the higher-rainfall areas and by better veld and general management in the lower rainfall areas.

FEEDING

Steady progress is being made in the method and scope of winter supplementary feeding. Urea-fortified protein cubes, and proprietary concentrates for mixing with farm-grown maize and cotton-seed are being widely used. Stress has been laid on the importance of pregnancy diagnosis as an aid to selecting the cows and heifers which should be given preference, and on the need to maintain weaners in their first winter, rather than to feed for a substantial live-weight gain.

During these past 14 months there was a large increase in supplementary feeding on the veld to improve the weight and grade of cattle sent into the Cold Storage Commission in late summer and early winter. Results were good in the lower-rainfall areas but the poor summer gains experienced in the higher-rainfall areas led to moderate success. Often steers were too light at the beginning of the season and insufficient amounts of concentrates were fed to secure good grades.

The number of cattle stall-fed in the maize areas was less than in the previous winter. Generally, cattle have been fed for earlier delivery and fewer cattle are coming forward from September to December. The principal reasons for this trend are the shortage of suitable feeder cattle young enough to finish at the Rhodesia Best grade, the lowered prices being paid for light cattle and cattle grazing below Rhodesia Best, and the increased producer price for maize as a result of the light 1963 crop.

BREEDING

As a result of the shortage of quality feeder cattle there has been a continuation of the swing towards cross-breeding and the use of bulls of the British and

Brahman breeds. This led to sharp competition again this year at bull sales where these bulls were on offer. There is a danger that some breeders may run into difficulties by failing to realize that management and feeding play the most important part in the production of well-finished slaughter cattle at young ages. In addition cross-breeding can lead to a breakdown of long-term breeding plans, especially on small farms and where pure-bred replacement females are difficult to obtain. With many farmers specializing in rearing cattle rather than breeding there might well be a shortage of breeding stock in a few years' time. The position requires close scrutiny.

DAIRY CATTLE

Dairy farmers have had no respite from the pressure of rising costs during the year and a number of producers have dispersed their herds. In the majority of cases, however, the efficiency in production has steadily improved. Officers of this Department have made a special effort to assist in reducing costs through emphasizing the need for greater reliance on home-produced feed. The findings of the Ministry of Agriculture Milk Production Cost Investigation which highlighted the general heavy reliance of producers on purchased concentrates has been widely disseminated.

There has been a tendency for the larger herds to increase through the purchase of cows from dispersed herds. It is essential that an increase in the scale of production should be accompanied by an increase in the efficiency of production and a lowering of the cost of feed. There has been an increase in the number of courses, discussion groups and individual visits made by officers in all regions.

SHEEP

There has been a steady increase in the size of the national flock in recent years and the tendency towards larger flocks on farms. Every effort has been made to encourage these trends since the chief factor mitigating against higher levels of management has been the small size of flocks and the insignificant contribution they have made to the cash income on farms. There is also a steady improvement taking place in the quality of flocks in terms of conformation through the wider use of rams of the Dorper, Wiltiper and, where pasture grazing is available, German Merino breeds. A tendency to market lambs before they are ready has manifested itself with the result that the farmers concerned have been disappointed in their returns. The need to feed the ewe to stimulate milk production rather than to feed the lamb has been stressed in extension work.

By organizing a national competition in sheep management the Sheep Breeders' Association is assisting materially in promoting this form of production.

PIGS

Though faced with overproduction, pig breeders have maintained a good standard of quality. The feeding of farm produced maize is the basis of profitable production and, in consequence, the scale of production on farms in the maize areas is increasing at the expense of the smaller producer who has to purchase grain. The feeding of corn- and cob-meal in pig rations has been more widely done with considerable success.

FISH

Few farmers have adopted the pond method of fish production, though this has been shown to provide high yields of Tilapia suitable for labour rations. As a result of farmers encouraging Africans to fish in their spare time, a very considerable contribution to the diet of farm labour is now coming from farm dams, nearly all of which have been stocked.

LIVESTOCK IMPROVEMENT SCHEME

The Federal Beef Recording Scheme introduced on 1st November 1962 has evoked a good response. To date 69 breeders have applied to participate, which involves recording some 7,400 breeding cows and their progeny. Of these breeders, 56 are breeding bulls for sale.

During the latter part of the year, representatives of the Livestock Improvement Committee visited the Republic of South Africa to purchase sheep-breeding stock on behalf of farmers in the Federation. This new development was justified by the keen demand for sheep in the country which could not be satisfied. Purchases on this trip totalled 49 rams, 306 ewes and 59 lambs.

Details of total importations and purchases by the Livestock Improvement Committee on behalf of farmers are shown in Appendix VII.

d. IRRIGATION DEVELOPMENT

GENERAL PROGRESS

Good progress was made in the general field of irrigation—particularly in the Victoria lowveld to which reference will be made later in this section. In other parts of the country supplementary irrigation of cotton, maize and, to a lesser degree, tobacco, all proved satisfactory. High yields of maize, as much as just over 60 bags per acre, were obtained.

The trend over the last few years has been inclined towards a reduction in acreage of supplementary irrigated crops but with the very good results obtained this year there is likely to be a slight increase in the near future.

VISITS AND COURSES

During the year 374 advisory visits were made to farmers in connection with irrigation by Irrigation Officers. Many visits (numbering 1,060) were also made by local Field Staff. A number of field-days and discussion groups were held on irrigation and good use was made of opportunities of addressing Intensive Conservation Area Committees and other groups on the general subject of irrigation in relation to crop production.

WATER SUBSIDIES

The past year was a reasonable one as regards water supplies. Most dams filled and the streams and rivers are all flowing strongly. The Umshandige Dam has risen considerably and farmers are now again on full allocation of water.

Because of the better water supplies there was a slight expansion in winter irrigation.

MAJOR SCHEMES

Triangle/Hippo Valley

As a result of greatly increased world demand for sugar and the recent completion of the Bangala Dam there is tremendous activity in the Triangle/Hippo Valley area in putting in additional acreages of cane. The results this year were very satisfactory with yields of 60 tons per acre per annum being obtained by some settlers and on some of the estate sections. Interest in other crops is also mounting. Burley tobacco on one estate proved very satisfactory—good yields and prices having been achieved. Other crops, such as cotton, soyas and lucerne will be tried and methods of flood irrigation will also be carried out this summer.

Umshandige

At the beginning of the season the water supplies in the Umshandige Dam were very low and there was a threat that in the absence of good flows into the dam the water allocation, already reduced, would be further reduced to only 50 per cent. of normal. Fortunately, the water-level rose considerably during the rains and a full allocation was possible for the 1963 dry season.

The barley crop promises to be a very good one yielding 20 bags per acre.

Umgusa

Except in the case of a few farms most of the irrigation on these sandy soils is done by overhead sprinklers. Fodder crops and vegetables continue to be the main crops.

Mazoe Valley

The capacity of the Mazoe Dam was increased by about 50 per cent. in consequence of the wall having been raised by 10 ft.; the extra amount of water thus stored enabled the Mazoe Citrus Estate to increase substantially its citrus plantings.

Chirundu

All the irrigation is done by overhead sprays, which is probably the only method that can be used on these very fine sandy soils. Yields are improving and it appears that expansion of production is planned.

NGESI DAM

Sherwood Irrigation Scheme

Negotiations between the Electricity Supply Commission, Irrigation Department and farmers have been completed and seven farmers will be receiving water from the Umniati Canal. This is a valuable new development in the Midlands.

IRRIGATED CROPS

(a) *Sugar Cane*

Interest in this important crop has developed tremendously in Rhodesia because of poor sugar-beet crops in Europe and a world-wide shortage of sugar.

(b) *Fodder Crops*

Lucerne, oats and barley crops still account for the bulk of irrigated crops, other than sugar-cane. There has been a satisfactory improvement in yields and management of lucerne and such good results are being obtained from oats and barley that for many farmers it is better to grow these winter cereals in conjunction with a summer fodder crop such as maize than to attempt lucerne in areas where high rainfall tends to be a limiting factor in summer.

(c) *Maize*

For dryland farmers this past season was a difficult one as regards maize but where supplementary irrigation was practised, particularly in those cases where planting and germinating took place before the rains, the results were very satisfactory and a number of farmers obtained yields of 60 bags per acre.

(d) *Tobacco*

Owing to the difficult season supplementary irrigation of tobacco proved quite successful in some parts of the territory. The trend seems to be towards increased acreages under supplementary irrigation in some areas and in others the position is static.

(e) *Cotton*

The indications are that cotton acreage will increase and that as supplementary irrigation has proved successful this, too, will increase where cotton is concerned.

(f) *Wheat/Barley*

There has been an increase in the acreage planted to these two crops which is in contrast to the trend of the last few years. With the use of new varieties and better standards of management, yields have improved greatly and there should be a steady increase in the overall acreage established to these crops each year.

(g) *Vegetables*

The production of fresh vegetables continues in a satisfactory manner and the production for the canning factory in Umtali is improving. After many years of growing peas the yields have steadily gone up but unfortunately frost caused quite a lot of damage during this last winter.

(h) *Potatoes*

For several years now the country has virtually been self-supporting in potatoes. This year frosts caused damage in certain areas but on the whole the crop was fair.

(i) *Pastures*

Only a few farmers now grow temperate grass/clover pastures. The popularity of pastures has steadily declined and winter cereals and lucerne have increased in acreage.

SABI VALLEY DEVELOPMENT FARM

The Sabi Development Farm is still serving a very useful purpose. Improved methods of planting and irrigating were tried on a larger scale this year and proved very satisfactory. Eighteen acres of cotton were planted and gave very good results.

The sheep are thriving and an excellent flock has been built up. The introduction of Suffolk rams has produced very good lambs. The present policy is the selection of ewes on the basis of milk production and rapid growth of lambs.

D.3 *SOIL CONSERVATION*

a. ARABLE AREAS

The demand for the pegging of contour ridges was well above normal and the total pegged was the highest for eight years. Standards of construction and maintenance were still low and the past high rainfall season showed this up in no uncertain way. The failure of contours should impress this inadequacy on farmers, whose attention is being drawn to the need for better all-round work. Waterways, too, require better preparation and care and should not be carelessly ploughed through or used as roadways. This is also receiving attention.

The Land Protection Committee completed its report and issued the revised version of the bulletin 'The Mechanical Protection of Arable Lands'.

Detailed statistics relating to conservation works pegged are contained in Appendix IV.

b. African Cultivation

Intensive Conservation Area Committees were very active in many areas and this led to a reasonable control of African cultivators. In Matabeleland, it is estimated that more land in the European farming area is being cropped by Africans than by the landowners, so it is obvious that this could develop into a tremendous problem.

Many landowners have not made sufficient effort towards preventing uncontrolled cultivation and this has led to deterioration of the position in some areas. Farmers should demarcate areas within which their labour forces are permitted to cultivate. At the same time, those areas which are to be settled must be planned, wherever possible, before settlement takes place.

c. Roads and Railways

Close liaison between the Roads Department, Road Councils, Rhodesia Railways authorities and this Department was maintained during the year. Co-operation between these organizations and the Department is good and numerous problems of road drainage and alignment have been solved mutually, to the satisfaction of all concerned.

On occasion conservation works have been blamed for damage done during the past season but this cannot be substantiated. The heavy rains experienced resulted in above normal run-off which inevitably would have caused damage under the circumstances.

d. Veld Management

Farmers have become increasingly aware of the necessity and value of good veld management but unfortunately comparatively few endeavour to practise it.

Localized overgrazing is closely associated with the lack of evenly distributed watering points. Overstocking will therefore remain a problem until such time as stocking capacities of farms are related to the area that can be effectively grazed from any particular watering point.

Ranch planning services proved valuable in the application of sound principles of veld utilization by planned fencing, water development and correct stocking. To obtain improved veld utilization, efforts were made to furnish farmers with details indicating the effective grazing radius from existing water points, the realignment of fencing to coincide with the grazing range of stock and the size and assessed carrying capacity of paddocks.

Farmers are beginning to appreciate the importance and value of light summer stocking and this system is being developed over most parts of the territory.

e. Veld Fires

All Regions, with the exception of Matabeleland, reported fewer veld fires during the past year. Uncontrolled fires were invariably confined to unoccupied or understocked farms. Intensive Conservation Area Committees, in general, have been very conscious of the fire hazard problem and have taken steps through the use of propaganda and the employment of rangers to reduce the incidence of fire. Committees are aware of the need to obtain the co-operation of absentee landowners and that of farmers whose properties are understocked, in their approach to the entire question of veld fire control.

f. Bush Encroachment

There is still a serious problem because in many areas the value of land is far below the cost of restoring it to productivity.

In the lowveld, where the bush encroachment problem is most serious, demonstrations have been in operation to indicate methods and systems of control, as well as the importance of correct stocking in maintaining the optimum balance between grass and woody vegetation.

The more progressive farmers are attempting to control bush encroachment by observing the established principles of veld utilization, with the major emphasis on correct stocking, provision of rest periods and a programme of opportunistic, planned burning. Clearing in conjunction with chemical control is fairly extensively practised.

g. Fencing

Good progress was made in some areas but elsewhere limited capital and political uncertainty limited development.

h. CATCHMENT SCHEMES

Catchment protection works costing nearly £1,000 were completed in the Mtoko, Barwick, Karoi and Essexvale areas.

Progress in catchment protection was hampered by lack of funds, especially in the Inyankuni catchment in the Essexvale I.C.A. In view of the comparatively small sum required for this project and the fact that the Government's share is unlikely to be more than one-third, it is hoped that money will be made available as soon as possible to complete this protection work.

D.4. *WATER CONSERVATION*

a. DAM CONSTRUCTION

The number of dams constructed over the past year was 376. This figure shows an increase of 101 over the previous year but is still well below the highest annual figure. Interest in dam construction has been affected by the political situation, the shortage of subsidy funds, the preceding good rainy season and a genuine lack of capital.

The average capacity of dams increased during the past year to the record figure of 8,000,000 gallons per dam constructed. This is a continuation of a trend which has been in progress for several years. For full details see Appendix V which also shows the total number of dams and water stored over the period of the Federation's existence.

b. MECHANICAL UNITS

Government Units—the Department's fleet of heavy earth-moving equipment, was kept very busy throughout the year. The major projects worked on were:

(i) Bush clearing for the control of tsetse on the Moçambique border.

(ii) Land development in Sipolilo and Vuti.

(iii) Dam construction, stumping, ripping and contour building on farms, mainly in the Mashonaland Region.

D.5. *FIELD TRIALS*

Ninety-three critical experiments capable of statistical analysis were carried out on farms in the period covered by this report together with 90 demonstrations and observation trials. In the former category were 12 maize variety, six sorghum variety/seeding rate and seven special liming trials done at the request of and in collaboration with the Department of Research and Specialist Services which also co-operated very closely in the establishment of certain other critical experiments through the provision of designs and seed. Statistical analyses of results were undertaken by the same Department. Also included in this total of 93 were 18 trials done in collaboration with the Tobacco Research Board.

Much useful information was garnered from these trials and the demonstrations constituted a powerful extension tool in the hand of the field officers who supervised them. As in previous years the results of the critical experiments, other than those concerned with tobacco, will be collated and written up in due course as a permanent record of what was accomplished and of the conclusions that were drawn.

A detailed list of field trials conducted by the Department is contained in Appendix VI.

D.6. *ADVISORY SERVICES*

a. VISITS TO FARMS

There was an increase of 1,900 visits to farms (total 23,387 visits) on all aspects of advisory work compared to the previous year. This increase reflects the implementation of the departmental policy to further the development of crops such as Burley tobacco, Turkish tobacco, cotton, groundnuts, soyas, etc., while maintaining the level of advisory work in other lines of production. Many of these visits were made in the course of developing extension programmes based on the particular needs of each Intensive Conservation Area.

b. FARMERS' DAYS, COURSES AND DISCUSSION GROUPS

Field staff, as a result of an encouraging interest by farmers, organized 292 more courses, discussion groups and field days (total 1,274) than in the previous year, reflecting the increased emphasis on this effective group extension approach. Courses largely based on theoretical aspects were well attended and the subjects covered were flue-cured and Burley tobaccos, beef cattle, sheep and dairy cattle management, farm management and work study.

c. AGRICULTURAL SHOWS

Departmental exhibits were prepared for each agricultural show, the main effort being made at the Salisbury and Bulawayo shows, where more reliance was placed on assistance from skilled display artists. This approach drew large numbers of the public to the exhibits and much favourable comment.

The standard of entries in all sections of shows continues to rise. Livestock entries at the Royal Bulawayo Show in the fatstock section particularly were very satisfactory in regard to both numbers and quality. At Salisbury, though the number of entries was lower due to higher entry fees in the cattle section, the desired result of increased quality was realized.

Senior officers were called upon to act as judges at the Bulawayo, Salisbury and most of the smaller shows.

d. CONSERVATION EDUCATION

Officers of the Department again served on Conservation Education Action Committees brought into being in various centres under the aegis of the Natural Resources Board. Good progress was made in organizing outings for teachers and schoolchildren and generally in advancing the principle of assisting the former to obtain material and background for the introduction of the general principle of conservation into their school curricula. In this connection attention was paid to assisting teachers of geography to obtain material on local ecology and industry for the General Certificate of Education curriculum.

Because this year Natural Resources Board's conservation theme was Minerals, less direct assistance was necessary from the staff of this Department than in previous years when themes concerned natural resources such as trees, shrubs and water.

D.7. *EXPERIMENT FARMS*

a. CHIPINGA

The dairy herd now organized on a system of summer production had its most successful year with a herd average of 9,000 lb. The system of rearing calves on deep litter under a thatched roof continued to give satisfactory results and the heifers were sufficiently well grown to calve down at 24 months without adversely affecting their development.

Careful records have been kept on all inputs of the dairy unit and the cost of milk per gallon under this summer system of production was the lowest so far achieved.

The first group of Friesland steers reared for beef production reached satisfactory weights and grades. This trial indicates that this method of beef production can be profitable. Good progress was made in expanding the German Merino flock. The aspect of management which has been largely responsible for the improvement in the standard of the flock is lighter stocking in summer, resulting in better internal parasite control.

Burley tobacco was grown on the farm for the first time and in spite of a very high relative humidity during curing, 1,640 lb. per acre of good-quality leaf were sold. Trials will continue.

Work on the Coffee Section continued with fertilizer, lime, mulching, thinning and variety trials. During the year a coffee processing factory was designed and constructed and will be ready to process the 1963/64 season crop. Nurseries were established to provide seedlings of the most promising varieties which will be planted out to expand the present 10-acre plantings to approximately 25 acres in the course of the next four to five years. Samples of coffee beans from the farm were sent to the coffee buying concerns and preliminary reports concerning the quality of these small consignments are extremely encouraging.

Several crop trials were conducted on the farm during the year.

To ensure close liaison with the farmers of the area a Liaison Committee under the chairmanship of the Group Conservation and Extension Officer met regularly.

b. KAROI EXPERIMENT FARM

The rainfall of 41.19 in. was above normal, the average for nine years being 35.58 in., but in spite of this fact and an extremely wet December when no less than 15.16 in. were recorded, crop yields were satisfactory.

Maize grown for grain and silage yielded well at the equivalent, from test yields, of 25 bags per acre. The best results came from S.R.H. 52 with 29.5 bags per acre which justified the extra cost of the seed involved. The difference in yield between S.R.H. 52 and S.R.H. 15 on the same land was 5.5 bags.

Soya beans did well and though used mainly for silage and hay, yielded at the rate of seven bags per acre where taken for seed. 492A and 493A Rhizobial inoculant from Grasslands Research Station was used.

Once again the Mount Makulu Red variety of groundnuts at 30 bags of unshelled nuts per acre outyielded the Valencia variety. *Crotalaria ochraleuca* was grown successfully for hay, yielding two to three tons per acre and velvet beans grazed by beef cattle gave a liveweight gain of 1 lb. per day during early winter. Dhal planted in association with winter-grazed pastures and veld again maintained cattle through the dry season. *Desmodium discolor* and *Desmodium intortum* also showed promise as a source of winter protein when grazed with pastures and veld.

Six Burley tobacco trials were carried out in co-operation with the Department of Research and Specialist Services and the Tobacco Research Board.

The breeding cattle herd had a good season—80 per cent. of the cows calved—but weaning weights were low, due largely to the abnormally heavy rain in the months of December and March. In a feeding trial to compare the relative values of maize hay and maize silage the cattle on silage were 40 lb. heavier than those on an equivalent ration of maize hay. There were indications that the silage was most effective in providing gains when the cattle were near to final slaughter condition.

In the summer finishing trial on grass the cattle given 2 lb. of a urea fortified protein cube (30 per cent. C.P.) plus 5 lb. of maize meal per day gained at a rate of 1 lb. a day higher than those on 5 lb. of maize meal, indicating that good results in summer fattening appear to depend upon a protein as well as a carbohydrate supplement.

The pigs and sheep continued to make good progress. In the case of the sheep a feeding trial indicated that better results can be obtained by stimulating milk production through feeding the ewe rather than from heavy creep feeding of milking lambs.

The programme for the year was again prepared in consultation with a liaison committee representative of local farmers.

E. NORTHERN RHODESIA

E.1. *ORGANIZATION AND STAFF*

There have been no major changes in the organization and staff of the Department of Conservation and Extension in Northern Rhodesia during the year.

Dr. Vincent was appointed Regional Director following the retirement on pension of Mr. R. H. Fitt.

Four Conservation Officer posts were filled during the year and the Department was able to carry out its duties satisfactorily. The appointment of a number of new recruits to the Broken Hill, Mkushi, Chisamba and Lusaka Intensive Conservation Areas did have an effect on the output of work in these areas as these officers had to spend time on in-service training and on learning to know their areas.

Despite the lack of staff for short periods in some Intensive Conservation Areas and the unavoidable time spent on various training courses, the overall service provided by the Department in Northern Rhodesia was reasonably well balanced.

At present there are five vacancies in the Department in Northern Rhodesia; these are for one Planning Officer, three Conservation Officers and a Horticultural Farm Manager for the Copperbelt Experiment Farm.

The policy of programme planning in the overall organization has created closer liaison and co-operation between Intensive Conservation Area Committees and the Department's staff.

Staff housing problems, although not entirely eliminated, were sufficiently improved to reduce long-standing complaints to a minimum.

For a considerable portion of the year, the impending dissolution of the Federation caused anxiety and provoked a sense of insecurity among staff. It is worthy of note that despite understandable anxieties connected with the break-up of the Federation, all staff continued to give loyal and full service to the Department.

E.2 *GENERAL AGRICULTURAL, CROP AND LIVESTOCK INFORMATION*

a. CLIMATE

The cropping season started off well in Northern Rhodesia with widespread rains beginning about the 6th November. The rains continued in all areas and by the end of November the major portion of the tobacco crop had been planted. Total rainfall figures for the month were above normal, in many areas being twice the normal.

December was an extremely wet month and rain fell with little or no respite. These very wet conditions seriously affected all crops and many farmers were unable to complete their maize plantings and carry out normal cultivations.

In the northern areas, heavy rains continued throughout January but further southwards there was a gradual decrease in the rainfall and a very welcome dry spell of about two to three weeks occurred. This was followed by heavy and widespread rain in February with overcast conditions, mainly in the southern half of the territory. This caused widespread waterlogging of lands and high peak flows in the streams and dambos.

During March the main rains gradually eased off with intermittent storms and light showers. Scattered showers continued mainly over most of the northern half of the territory for the first three weeks of April.

The total rainfall figures for the season were far in excess of normal in the southern and central portions of the Territory and crops and livestock were adversely affected. Livingstone had a total rainfall of 39 inches compared to a normal figure of 28 inches, Choma had 45 inches as against an average of 30 inches and Mazabuka 42 inches compared to an average of 30 inches.

Hail was not unduly widespread but did cause damage on individual farms.

Temperatures dropped earlier than normal and frosts caused damage, especially to citrus, bananas and dhal.

Winds were gusty from July and temperatures rose sharply in August.

b. Crop Production

Food Crops

Maize

The 1962/63 season was a poor one for maize production and the estimated yield will be about 50 per cent. of last year's crop. The area planted was about 70 per cent. of the 1961/62 acreage. This was due mainly to the early rains continuing without a break and many farmers being unable to get into their lands to plant. Excessive rain and lack of sunshine made cultivating difficult, and waterlogging also affected the growth of maize on many of the heavier, low-lying red soil areas. Where land preparation had been completed so as to enable early planting to be done some excellent yields of over 40 bags per acre were obtained.

The importance of good land selection and preparation, ridge and furrow drainage, early planting, adequate plant populations, proper fertilization and the use of hybrid maize seed for high maize yields cannot be over-emphasized. The danger of corn root worm is still present and the use of insecticides to combat this pest as well as termites has been more widely adopted.

Sorghums

A total of about 2,500 acres of sorghums was planted out. A large proportion of this crop was planted late as a replacement for maize which could not be planted due to the weather. Yields of six to nine bags per acre were obtained from the early plantings but the January plantings yielded only about four to five bags per acre—so reducing the overall yield per acre. In many cases stalk borer and fungal diseases reduced the yields. Another limiting factor was that of low plant populations.

Groundnuts

The crop this year was disappointing. It is estimated that about 2,000 acres were planted but average yields were only about three to four bags of shelled nuts per acre. Mount Makulu Red was the main variety grown and where this crop was planted reasonably early, and the plant population was high, yields of up to ten bags per acre were obtained. The main limitation to obtaining high yields has been one of inadequate plant population.

Wheat

The new varieties of wheat bred at Salisbury Agricultural Experiment Station were grown very successfully under irrigation during the winter. Several farmers planted large acreages varying from 50 to 230 acres in extent. Over 1,400 acres were grown this season, a figure which would have been even greater if adequate supplies of seed had been available. Very large acreages produced yields of over 17 bags per acre. With more strong-strawed wheat varieties now available, capable of standing up to heavy fertilizer applications, the limiting factor in economic wheat production is no longer variety, but management, particularly soil and water management.

There is no doubt that the methods of irrigating wheat demonstrated at the Chalimbana Experiment Farm should result in considerable improvements in the efficiency of wheat production and lead to considerable expansion in the future.

Potatoes

Yields of potatoes obtained during the year were:

Rainy season crop	41,000 pockets
First irrigated crop	78,400 pockets
Second irrigated crop	94,000 pockets
	213,000 pockets

Northern Rhodesia requires 368,000 pockets annually, which means that this year's production left a shortfall of 155,000 pockets. (One pocket = 37½ lb.)

The rainy season crop averaged only 230 pockets per acre because much of the crop was ruined by excessive moisture at the ripening stage. Spray measures kept late blight under control.

Yields of up to 600 pockets per acre were obtained in both irrigated crops.

Onions

This year's crop is estimated at 90,000 pockets. (One pocket = 30 lb.)

Onion thrips and alternaria disease caused yield reductions in the Broken Hill area where growers failed to spray against the pest and disease.

Other Vegetables

Tomatoes form the main single vegetable cropped in Northern Rhodesia, the rainy season production being from 75 acres (average yield 24 tons per acre) and dry season from 125 acres (average yield 15 tons per acre). The rainy season problems of blight and bollworm were kept completely at bay by spraying. Wholesale prices on the Copperbelt dropped to 3d. per lb. in late February and March, which represents a low price record for the area at this time.

Other vegetables were produced from over 1,000 acres.

The marketing system established in Lusaka (stalls in an allocated open area) has changed Lusaka's habit of relying upon tinned food to one of using fresh vegetables, and the consumption of vegetables continued to rise. Competition at the stalls has led to much improvement in quality and presentation.

Citrus and Sub-tropical Fruits

Citrus

Three-hundred-and-fifty thousand pockets of fruit were obtained from 80,000 trees off approximately 1,000 acres. Two washing plants and pack-houses are now established, one on the Copperbelt and one in Lusaka.

Exports to Katanga have fluctuated from 200 to 600 pockets of oranges per week.

Management of citrus trees has shown considerable improvement in Northern Rhodesia, but there are still a few citrus orchards that have been allowed to deteriorate, thus reducing the overall yield in the Territory.

Bananas

Two-hundred-and-thirty tons of bananas were reaped from 170 acres of palms. Thirty acres of this total area were abandoned due to frost, and ten acres because of impeded drainage, leaving 130 acres in production. Since August a further 25 acres have been planted at Chirundu, giving a total of 165 acres to date. In order to satisfy local requirements the Territory imported 1,830 tons of this fruit during the year.

The overall picture has been most disappointing as no crop responds more to good management than bananas.

Pineapples

A total of 34 acres of pineapples is now established. The bulk of this crop is the Smooth Cayenne variety, and is being grown mainly in the North-Western Province. Most pineapples from this area are not marketed because of the difficulty of transporting the fruit to the Copperbelt markets.

OTHER SUB-TROPICAL FRUITS

Avocados are over-produced and, because there are unfortunately no extraction units to make use of the oil, fruit are left to rot on the ground.

Mangoes find an outlet in the African markets. Litchis produce two crops a year in December and August and three acres have been established. Papaws and guavas produced in back-yard gardens meet the country's needs and in consequence command a poor price in the market-place.

CASH CROPS

Virginia Tobacco

(i) *Seed-beds*

The standard of seed-bed management was good but faulty watering techniques resulted in uneven growth. Spraying programmes were regularly carried out and resulted in general freedom from disease and insect attacks.

(ii) *Land Preparation*

The sub-soiling of lands before ploughing resulted in a considerable improvement in the preparation of late ploughed lands. More lands, both reverted and virgin, were fumigated than in previous years.

The prolonged waterlogging of crops was aggravated by badly built and poorly maintained ridges, which directly reflected the standard of initial land preparation.

(iii) *Crop Management*

Planting commenced during the first week in November and approximately 70 to 80 per cent. of the crop in the South-Western Area and 50 per cent. in the Eastern Province were planted out by the end of the month. The early planted crops grew well but as the planting date advanced into November, growth became progressively less and the plants smaller and spiky. Unfortunately, the later plantings were given heavy top dressings of nitrogen which produced poor-quality leaf.

Topping was generally high as plants carried only 14-16 leaves.

Budworm and stinkbug attacks were serious in all areas but were controlled by spraying.

(iv) *Reaping*

As ripening was uneven and slow in the early stages, too much green tobacco was reaped. Later, when ripening became more rapid, leaves showing wide variations in ripeness were taken at each reaping. This was aggravated by false ripening. Much top leaf was lost due to alternaria and excessive nitrogen.

(v) *Curing*

Curing early in the season presented no problem except in barns where leaves varied in ripeness. Later in the season, uneven, false and slow ripening, alternaria and excessive nitrogen in the top leaves caused many curing difficulties. Barn rot was also a problem.

(vi) *Buildings*

Because of the climatic conditions which caused slow ripening, and the many additional barns that were built, barn accommodation did not constitute a shortage at any time.

On newly developed farms, building layouts could be improved, particularly in the Mkushi area.

(vii) *Bulking*

Over-conditioning of leaf in bulks and bales due to high humidities resulted in loss of leaf.

(viii) *Grading, Baling and Presentation*

Work study techniques are being increasingly applied by farmers in their grading sheds to improve grading. A considerable proportion of the crop is commercially graded.

(ix) *General*

Culturally, the season was a difficult one and low yields were obtained, but fortunately this was off-set by the high average price of 41.62d. per lb. which was 6.66d. per lb. higher than for the 1961/62 season.

The comparison between the 1961/62 and 1962/63 seasons is given below:

	Season	*Area*	*Weight*	*Value*	*Average Price/ (lb.)*	*Average weight/acre*
		(acres)	*(lb.)*	*£*	*d.*	*(lb.)*
*N.W.R.	1961-62	15,530	15,188,913	2,212,729	34.96	978
	1962-63	20,176	17,000,000	1,900,000	41.62	843
*N.E.R.	1961-62	1,340	958,064	144,947	36.31	714
	1962-63	1,360	1,170,000	—	—	860

* Estimate.

Turkish Tobacco

Seed-beds were badly affected by heavy rains and some of them were washed out. Early plantings showed good growth but later plantings suffered severely from lack of moisture. Some bushy top disease occurred in crops in the Southern Province and the ripening of the crop there was severely affected by the cold spell from the last two weeks in April onwards.

Burley Tobacco

In the Eastern Province seed-beds suffered from faulty watering but were free from disease. The standard of land preparation and ridging was variable. Well over 50 per cent. of the crop was planted by the end of December and stands were generally good.

Primings and lugs were reaped too green and excessive humidity caused loss of leaf during curing due to bale burn and mould. Stalk cutting was often premature owing to the prevalence of spot diseases.

In the South-Western areas, seed-bed management was very variable due to the inexperience of growers. Planting commenced in mid-November and was completed by mid-December. Growth and the ripening of primings and lugs were slow owing to heavy rains in December, and spot diseases became a problem. The high humidities also caused pole burn and mould in the barns. The leaves of the stalk-cut plants cured out well. Barn accommodation was often a problem but this is being rectified for the 1963/64 season.

At the four Burley tobacco sales held in Lusaka, 103,742 lb. were sold for an average price of 27.86d. per lb. The average yield was approximately 730 lb. per acre from 142 acres.

Cigar Tobacco

Trade reaction to samples from the first of two trials of cigar wrapper tobacco grown on the Experiment Farm in co-operation with the Tobacco Research Board, were sufficiently encouraging for a larger experimental crop to be grown for a more detailed evaluation by the trade. Twenty acres of cigar wrapper leaf are therefore being grown by the Anglo American Corporation, who have willingly agreed to co-operate with the Department on their Bancroft mine farm during the 1963/64 season.

Cotton

Cotton production has expanded rapidly from 130 acres in 1961/62 to 657 acres in 1962/63. It is estimated that about 2,000 acres will be planted in the 1963/64 season.

The adverse weather conditions affected this crop—especially in the early stages when weed control was a problem—and difficulty was experienced in getting the crop planted early. The growth of the cotton despite the wet conditions was reasonably good and yields of seed-cotton varied from 700 lb. to 2,000 lb. per acre.

Spraying of the crop can be improved as losses occurred later in the season due to American bollworm. Now that growers have had experience of this crop, individual acreages will be increased and instead of knapsack sprayers being employed, greater use will be made of tractor and ox-drawn sprayers. There is no doubt that the overall yield per acre and quality of the cotton can be considerably increased if particular attention is paid to land preparation and fertilizing, time of planting, weeding and thinning to a good stand, methodical spraying and proper picking at the correct time.

Seed Production

Seed production has remained almost static during the last few years and most of the seed requirements for maize, tobacco, potatoes and wheat have been satisfied by imports from Southern Rhodesia. With the dissolution of the Federation taking place shortly the overall position of seed production will have to be investigated.

FODDER CROPS

Lucerne

Very noticeable improvements can now be seen in all aspects of lucerne management. Lucerne production is almost entirely for consumption on the farm as a cheap source of protein-rich feed. The requirements of the several milling companies have still to be met from imports costing Northern Rhodesia some £20,000 per annum.

A comprehensive report on the prospects for developing lucerne production was prepared in close collaboration with the Northern Rhodesia Industrial Development Corporation, who have granted a sum of £500 towards setting up a model drying and processing unit on the irrigation section of the Chalimbana Experiment Farm.

Soya Beans

Despite the propaganda given to this crop, very little progress has been made in the production of soya beans either for grain production for sale or as a forage crop. A total of about 300 acres was grown but yields were generally poor. There seems to be a limiting factor in relation to obtaining high yields and further investigations will have to be carried out—especially in connection with varieties to suit Northern Rhodesian conditions.

Other Fodder Crops

Dhal suffered a set-back this year as severe frosts throughout the Territory affected this crop. The production of other fodder crops such as Jack beans, cowpeas, velvet beans and sunnhemp was limited due to the wet conditions and the amount of feed conserved for winter feeding was below normal.

There has been an increase in the acreage of established pastures, mainly for summer use. On one farm in the Mazabuka area, Giant Rhodes grass pastures have carried three cows in milk per acre throughout the summer period.

Sunflowers were planted late for fodder production but the management of this crop was poor and yields were very low.

The planting of *Desmodium intortum* in small acreages was tried out and this fodder crop is being carefully watched as it could play a very important role in future fodder production on farms.

Incidence of Disease and Pests

An outbreak of red locust from the Kafue Flats was noticed during March and April, covering an area from West Chisamba to West Lusaka. The outbreak occurred as relatively small scattered swarms and these did little damage to crops. The International Red Locust Control was informed and aerial spraying on a limited scale took place, but the swarms were too scattered to be dealt with adequately by aerial spraying. A close watch is being kept on further developments related to this particular outbreak.

Maize stalk borer attacks were heavier this season, especially in the sorghum crop.

Corn root worm incidence appeared to be less severe than in previous years. It is not certain whether this was due to climatic conditions or to more control measures being carried out against this pest.

c. LIVESTOCK PRODUCTION

The 14-month period covered by this report has been one of continued progress and, perhaps of even greater importance, one of consolidation. Producers have come to a far clearer understanding of the basic problems confronting them in regard to production and marketing.

Climatic conditions during the period were not particularly good for livestock production. The intense and heavy rains during December and January seriously affected fodder crop production and resulted in the flooding of the summer grazing areas. As a result of the poor summer grazing, livestock gains were not good and the relatively cold winter further affected the condition of cattle.

There were no serious outbreaks of disease during the year. Lumpy Skin Disease which was prevalent amongst dairy cattle in 1961-62 was again observed in a few herds but only affected a small number of cattle. The vaccination programme carried out in 1961 and repeated in 1962 effectively controlled the disease.

BEEF CATTLE

Several significant changes occurred during the year as a result of Government policy and the development of a clearer understanding on the part of the producers of the problems confronting them.

The expansion which had taken place in previous years in the winter fattening of steers for sale in the August/December period was considerably reduced in 1963 as a result of the revised price structure designed to spread deliveries throughout the year and to encourage production in the January-March period. Very few cattle were fed during the winter of 1963 and in order to bring forward supplies of beef during November and December 1963, an additional bonus on certain grades and weights of cattle had to be introduced by the Cold Storage Commission.

There was an increase in the number of cattle offered for sale in the January-March 1963 period as a result of farmers examining summer fattening on an experimental basis so as to gain experience for future years.

The number of cattle slaughtered by the Cold Storage Commission in Northern Rhodesia has shown a spectacular increase from under 20,000 head in 1961 to over 59,000 head in 1963. This clearly indicates the need for orderly marketing in an industry which of necessity operates on a long-term basis, and the support producers will give to a stable market.

The interest stimulated in summer fattening has caused a re-appraisal of past production methods, and farmers have become increasingly aware of the importance of obtaining maximum summer gains. There is little doubt that in the past the importance of achieving maximum liveweight gains during the summer has been overlooked and producers have focused attention on winter supplementation which in many cases has been used to make up deficiencies which occurred in the preceding summer rather than for supporting summer gains.

In many areas cattle are confined to the dambo grazings during the summer period because of the arable cropping taking place on the top land, and in a wet summer such as occurred during the past season, liveweight gains are extremely poor. Summer stocking rates are far too high on many farms and the yearling age group is generally the most seriously affected by this practice with the result that the 21-month-old yearlings in August are very often little heavier than the nine-month-old weaners.

There is no doubt that 'beef recording' has an important role to play in focusing attention on liveweight gains and may well form the first real weapon in the fight to make farmers more aware of the need for properly stocked and managed veld.

Fertilized grass leys will have an increasingly important role to play in improving the summer carrying capacity of many farms. The initial use of these leys should be for the summer fattening of steers and, apart from economically providing a first-class diet, will materially ease the pressure on the veld grazing.

In the field of winter supplementation greater use has been made of 'protein blocks' containing urea, minerals, vegetable proteins and carbohydrates. These blocks are far superior to the normal urea/salt block as they ensure a higher intake of urea and a more predictable response.

Pregnancy diagnoses are being carried out in many herds during the early part of winter to enable farmers to cull out non-productive females. This practice should also be related to winter supplementation, because the barren breeding cow being over-wintered for another breeding season will come through the winter in fair condition on the veld without supplementation. To feed indiscriminately the entire breeding herd in which up to 30 per cent. of the mature cows are barren, results in 30 per cent. of the feed being used on unproductive animals.

During the latter half of 1963 a larger number of young female breeding stock were offered for slaughter than in the past. It became necessary for the Director of Veterinary Services to enforce the legislation prohibiting the slaughter of potential breeding stock. This does not prevent a producer from fattening and slaughtering culled females.

The Copperbelt Experiment Farm has very clearly demonstrated that the Copperbelt has a great potential for beef production. The trials in progress show that with proper veld management and protein supplementation during the winter it is possible to produce a 2½-year-old steer weighing in excess of 1,000 lb. liveweight. Such production cannot be ignored in a country short of beef.

DAIRY CATTLE

There has been a tendency during the period under review for the smaller producers to increase their milk production, in an endeavour to meet rising costs and lowered returns.

The number of milk producers fell from 153 to 146 during the year (October 1962 to September 1963).

Efforts were made to reduce the amount of feeding stuffs purchased by dairymen but the poor cropping season tended to set back the progress being made towards attaining self-sufficiency in this field.

The emphasis placed last year upon the provision of adequate amounts of energy in dairy rations has been continuous. In order to produce cheap, high-energy rations producers have been encouraged to retain at least 12 bags of maize per cow, and this has been balanced with either home-grown or purchased protein.

Milk quality must receive more attention for the bonus paid for 'Total Solids' and good keeping qualities represents an appreciable addition to the producer prices.

Solids-not-Fat again showed a seasonal decline from August onwards and in the majority of cases the cause was obvious and due to the poor condition of the cattle.

Producers continued to fail to take advantage of the Milk Recording Scheme which was introduced in Northern Rhodesia at their request. Milk Records when properly used are the basis of herd management and improvement and at this time when producers are faced with a 'cost-price' squeeze and have little if any real knowledge of the input and output of their herds, it is disappointing to record that little use is being made of an available service.

Some culling of low producing animals took place in the majority of herds during the past year and farmers were encouraged to stall-feed their culled cows so as to obtain a worthwhile return for the carcasses. All too frequently culled Friesland females are not fattened out before slaughter and realize only a fraction of their potential carcass value. This is yet another reason for maintaining herds in good condition throughout the year so that culls can be disposed of to best advantage as and when they are selected without having to hold them on the farm for many months whilst they improve in condition.

SHEEP

During the year carcass grading of all mutton and lamb carcasses was introduced at Livingstone, Lusaka and Kitwe.

Interest was shown by a few farmers in sheep production but with one or two notable exceptions little was done to start up in production.

The possibility of producing Karakul pelts is being examined by one producer who intends crossing Black Head Persian, or other haired sheep, with Karakul rams. As the lambs will be sacrificed within 24 hours of birth it will be possible to lamb the ewes down twice a year as there will be little strain imposed on the ewes. Mortality amongst imported rams is likely to be high and for this reason the rams will be housed and managed intensively.

The possibility of running sheep under very intensive conditions is also being examined. When sheep are housed throughout the year in pens or yards many of the problems encountered under a system of normal grazing management are overcome. At this stage indications are that there is nothing basically wrong with intensively housing sheep and except for the need to pare the feet frequently no problems have been encountered. It is considered, however, that in order to make such a venture profitable a more productive breed than the Dorper is required as a wool clip could increase the returns considerably.

The control of internal parasites in sheep has been improved by the introduction of several new anthelmintics which have a much better coverage than some of the older remedies.

PIG PRODUCTION

Little change in the volume of production has taken place since the last annual report was written, and as the Federation has been oversupplied with pig products little encouragement has been given to new producers.

A new factory is in the process of erection in Lusaka and will come into operation before the end of 1963; its capacity will be considerably greater than present production. It is to be hoped that any expansion that does take place in production will be done on stable economic lines and not, as so frequently happens in the pig industry, on unsound lines resulting in rapid over-production followed by a slump.

The tendency for producers to neglect the weaner piglets and young growing stock, or to feed them low-quality rations, has resulted in short, over-fat pigs. This problem is accentuated where producers rely upon by-products such as brewers grains which are bulky and can be consumed in quantity only by the older and larger pigs.

The quality of stock being selected for breeding purposes is high and producers have been buying good type boars.

POULTRY

Poultry production expanded during the last fourteen months and an improvement in management has taken place. The expansion was noticeable in the Lusaka area and on the specialist poultry farms. This confirms the tendency for efficient poultry units to grow at the expense of the inefficient ones.

Mixed farms with well managed laying flocks which have good access to markets continued to benefit from using home-grown maize together with purchased concentrates. This made a considerable saving on feed costs. This practice has increased further during the year and enables the mixed farmer to compete with the specialist.

Egg and broiler producers had a good year with a firm market and good average prices. The improved broiler stock available has taken over all the high-class table bird market; egg producers, with less retail outlets for culled hens, are increasing sales of these birds to the African market.

An important event has been the introduction, in commercial quantities, of inbred laying stock and this will have far-reaching effects on egg production and egg marketing.

Poultry farmers continued to make extensive use of the poultry advisory services available.

LIVESTOCK IMPROVEMENT SCHEME

The scheme continued to be administered by the Department and during the year some 44 applications were received for grants of which 35 were approved.

Details of livestock importations into Northern Rhodesia from outside the Federation are contained in the Appendix VII.

GOOD CATTLE PRODUCTION BOUNTY

The scheme continued to operate during the period covered by this report and provided financial assistance to cattlemen.

The conditions governing the payment of bounty were amended during the year so as to debar producers who had received in excess of £2,000 from the scheme from receiving further assistance.

Relevant details regarding the applications received are given below:

Number of applications received: 238.

Number of applications approved: 219.

Number of cattle applied for: 2,017.

Number of cattle branded: 19,190.

Total expenditure: £26,468 0s. 6d.

Rate of Payments:

	£	s.	d.	
1-50 head	2	0	0	per head
51-100 head	1	0	0	per head
101-200 head		12	0	per head
Over 200 head		8	0	per head

E.3. IRRIGATION

During recent years a valuable nucleus of small irrigation schemes has been developed on private farms along the line of rail. The greatest development of Northern Rhodesia's irrigation potential has taken place in the Lusaka Group of Intensive Conservation Areas where there are now over 1,700 acres under irrigation. The total acreage for the Territory exceeds 5,000 acres.

During the year aspects related to irrigation were prominent on the agendas of several Intensive Conservation Area Committees. Three important matters were raised at the Annual Conference of Intensive Conservation Area Committees. These were:

(1) The need to implement the proposed Chalimbana Irrigation Scheme.

(2) The need for expanding the Irrigation Section of the Chalimbana Experiment Farm to guide practical irrigation farmers.

(3) The need for granting water rights without insisting on conservation works and the attaching of such rights to the land. A memorandum on these matters was submitted by the Department to the Water Board to assist in policy formulation.

The Irrigation Section on the Chalimbana Experiment Farm has been expanded as a centre for demonstrating to farmers new labour-saving and more efficient methods of irrigation. These very useful demonstrations are expected to bring about considerable improvements in the efficiency of water use throughout the Territory. The special irrigation field-day held in August was attended by 107 farmers.

In April the Northern Rhodesia Government published a policy statement regarding the financing of large irrigation schemes. However, much work remains to be done before schemes such as the Kaleya and Chalimbana could possibly be implemented.

Several types of special irrigation equipment were designed, constructed and adapted to local conditions during the past 14 months. This equipment has speeded up the system whereby farmers can now rapidly establish large acreages of crops such as wheat under an efficient irrigation scheme.

Rural electrification progressed during the year and this has stimulated greater interest in overhead sprinkler irrigation.

E.4. SOIL CONSERVATION

a. General

The aim of the Department of Conservation and Extension is to eliminate erosion. This aspect continued to receive high priority and, wherever possible, all lands needing protection were contoured. Stream-bank cultivation, grazing areas and road water disposal were given attention relative to their importance in the individual Intensive Conservation Areas.

The importance of vegetation as a protective cover either in the form of grass pastures or early planted crops with adequate plant populations is fundamental to erosion control and this aspect is continually stressed by all field staff.

b. Mechanical Protection of Arable Land

The emphasis on the mechanical protection of arable land has been concentrated in those areas where large-scale opening up of land is taking place such as in the Mkushi, Choma, Kalomo and Livingstone Intensive Conservation Areas. Although the progress of work has been fairly good, there is still a backlog which must be made up if further damage is not to occur. In some areas, farmers still do not accept the full implications of haphazard opening up of land.

The production of Initial Development Plans to ensure correct land layout and selection at Mkushi and in the Fort Jameson area is being given top priority and should assist the farmers there. Relevant statistics relating to this general field of activity are contained in Appendix IV.

c. Roads

Heavy storms during the last rainy season caused many washaways of roads and much erosion of drains in the Territory and a great deal of attention has been given to rectifying this damage. Correct road alignment is fundamental to any conservation layout and this aspect is given emphasis in regional planning, initial development planning and normal conservation layout on farms.

d. Drainage

Major drainage works in all regional plans have now been completed, those in West Lusaka being finished during this dry season. The unusually heavy rainfall of the past summer has highlighted certain inadequacies in some of the older regional plans—particularly with regard to drainage, and Intensive Conservation Area Committees in Broken Hill, Chisamba, Lusaka and Mazabuka requested the Natural Resources Board to re-open some of the plans in order to improve the drainage works in these areas. These drainage problems were surveyed by the field staff and proposals were put forward for their implementation. The necessary drainage works have now been constructed and it is essential that farmers use them as an outlet for their ridge and furrow drainage systems. Field staff have impressed on farmers the necessity to have their wet lands ridged and furrowed and in certain areas spent a considerable amount of their time laying out this system of draining these wet lands.

e. GRAZING AREAS

Due to the very wet season many of the flatter, low-lying areas were completely inundated which limited the area of summer grazing available. In addition, the veld did not grow out as well as usual and the summer weight gains of beef stock were generally poor. This aspect of adequate summer weight gains is being stressed as it is directly related to good veld management. Light summer stocking with proper rest periods and a controlled hot burn at defined periods will materially assist in keeping a reasonable balance between the grass and the bush. This approach is being undertaken in a practical way by field staff and demonstrations on selected farms will be carried out this coming season.

E.5. *WATER CONSERVATION*

Seventeen dams holding 353 million gallons were constructed by Government units under Regional Planning and one dam impounding nine million gallons was constructed by a farmer. This is a considerable reduction in the amount of water conserved compared to what was achieved in 1961/62. Dry-season water supplies in all areas improved considerably this year and stream flow was better than normal.

Heavy storms and continuous rains caused damage to a number of spillways and three small dams breached. The number of works thus affected constituted only a small percentage of the total constructed.

Since 1955, 342 dams holding 2,829 million gallons of water have been constructed under Regional Planning and the overall effect of these structures will provide long-term benefits to the Territory as a whole. The continuation and expansion of water conservation in all areas must be the aim of all concerned in the conservation and use of the natural resources of the Territory.

Water conservation statistics are contained in Appendix V.

E.6. *MECHANICAL UNITS*

a. GENERAL

In spite of certain staff changes those concerned in operating the Working Account managed to carry out their duties efficiently. The staff numbers were virtually unchanged and consisted of 12 Europeans and 64 Africans as follows:

6 Mechanical Supervisors.
4 Mechanics.
1 Welder.
1 Stores Officer.
64 African Drivers, Mechanical Assistants, grease-hands, stores clerks and labourers.

The equipment used was also much the same as last year and consisted of:

10 Caterpillar D7 tractors.
1 Caterpillar No. 12 grader.
Ancillary equipment and transport.

The heavy transport fleet was renewed during the year with Albion lorries, and two hydraulic rippers (one on temporary hire) were added to the equipment.

b. WORK DONE

The mechanical units continued to implement works under Regional Planning and constructed dams, drainage works and storm drains in Livingstone, Zimba, Choma, Mazabuka, Broken Hill, Kalomo, Lusaka and Chisamba.

Work for the Northern Rhodesia Government consisted of land preparation and conservation works at Chibila, repairs to a large dam at Namwala, and 800 acres of bush-clearing on the Copperbelt for the Forestry Department.

Bush-clearing was carried out as usual in all areas, and subsoiling of lands in Mkushi and Broken Hill with the hydraulic ripper has increased considerably. Costs have varied from £4 to £7 per acre depending on the soil type and whether previous cropping had been carried out. The road grader completed the programme of road grading for the Southern Rhodesian Government.

A very high standard of work was achieved in all spheres, and the reputation of the units was well maintained.

c. WORKSHOPS

Leave and other commitments depleted staff but by dint of hard effort all demands on the workshops were met.

d. STORES

Store holdings were further reduced during the year, but the only hold-ups for spares were due to inadequate stocks held by the agents. The most satisfactory feature is that the problem of minor assets control has at last been solved.

e. ANALYSIS OF WORKING HOURS

Net available working hours (including overtime, deducting servicing hours)	=	33,186
Percentage of hours worked	=	55%
Hours worked	=	18,299
Average hours per tractor month	=	138.5

Total output fell by 326 hours compared with last year, due to an increase of 2,400 hours in the hours lost due to wet weather. In all other respects, losses of time were reduced, and the efficiency of control was greatly increased—a state of affairs which is reflected in the financial statement.

f. FINANCIAL STATEMENT

Net profit for the year was £6,366 as compared with £214 for the previous year; this was achieved in spite of a reduction of £2,000 in revenue. The estimated loss of £55,000 in 1955/56 indicates the improvement made in this sphere, and the fact that a very efficient enterprise has been built up by the Department.

g. GENERAL

In spite of difficulties, these past 14 months have been successful, due in a large measure to the excellent support given by Working Account, Department and Ministry staff.

E.7. *FIELD TRIALS*

A comprehensive range of field trials and demonstrations was carried out on all the experiment farms and on a number of private farms. In co-operation with the Tobacco Research Board trials involving flue-cured, Burley, Turkish and cigar wrapper tobacco were done.

Soya bean spacing trials were established on the three experiment farms with the co-operation of the Mount Makulu Research Station. Indications of the potential for high yields of the new hybrid maize varieties were obtained in a trial in the North Broken Hill Intensive Conservation Area where SRH 52 yielded 52 bags per acre. The trials on the Mochipapa Experiment Farm were adversely affected by the heavy rains throughout November and December.

Winter wheat trials have been carried out on farms in the Mazabuka, Lusaka and Chisamba Groups and the new varieties, Marodzi, Kafue, and Mazoe show considerable promise.

Experimental work in horticulture has been greatly reduced on the Copperbelt Farm due to staff shortage. Veld management and grazing trials conducted there indicate that with correct stocking rates the area is capable of sustained high production.

Groundnut trials carried out in various areas having very different climatic and soil conditions indicated that this crop has a potential for high yields provided that the correct variety is grown.

The trials and demonstrations carried out during the 1962/63 season are listed in Appendix VI.

E.8. *ADVISORY SERVICES*

a. GENERAL

The number of field visits made by officers of the Department was slightly less than the total of the previous year, the figure being 11,009 compared to 12,247 during 1961/62.

During the year special emphasis was placed on the completion of regional planning. A great deal of attention was also given to farm planning, irrigation and crops such as cotton, groundnuts and Burley tobacco. Greater emphasis was also placed on aspects of veld management.

Officers continued to take advantage of the in-service training courses available and attended those which they felt could be of greatest use to them. (*See* list of courses in Appendix VIII).

The system of programme plans has brought more efficiency in the development of agriculture in each Intensive Conservation Area and has improved staff operations at the same time. Officers and Committees working in close consultation are carefully considering the needs and problems of their areas so that they can be more effective in achieving their objectives.

With the great changes taking place in agricultural production, future emphasis will be placed on meeting the challenge of efficiency in all aspects related to crop and livestock husbandry. Every effort will be made by the Department to ensure the adoption of the best-known methods of production.

A comprehensive schedule showing the number of visits made by officers of the Department during the year is given in Appendix IX.

b. FIELD-DAYS AND DISCUSSION GROUPS

There was a further decline in the attendance at field-days and discussion groups. During the year 109 of these gatherings were held, attended by 2,690 people. The large group field-days have been replaced in many Intensive Conservation Areas and Groups by the smaller more intimate discussions and field-afternoons. Particular attention has been given to methods of increasing efficiency of production in all sectors while the role of alternative crops has not been overlooked.

c. SHOWS

It is pleasing to note the increasing interest being shown in the Copperbelt Agricultural Show. There was strong competition in the dairy and beef classes, but competition at Ndola was poor.

Although livestock entries for the Lusaka Royal Show were again disappointing, there was some keen competition in the agricultural produce classes. The Mkushi District Exhibit was outstanding and highly praised by the judges. Entries in this class, however, continue to be very poor. Africans participated to a much greater degree than hitherto, particularly in the agricultural classes. The Friesland bull from the Chalimbana Experiment Farm won the Llewellin Cup for the champion animal on show.

The Department exhibited at all agricultural shows and officers acted as judges and stewards.

d. YOUNG FARMERS' CLUBS

The appointment of an American 4H club leader to assist Young Farmers' Clubs should help to revive the flagging interest in the movement, particularly amongst the European clubs.

The African clubs reported excellent progress and parties of children from European and African clubs were conducted around the experiment farms.

E.9. *PLANNING*

a. REGIONAL PLANNING STAGE I

The table in Appendix X shows the progress that has been made in Regional Planning. Three plans comprising 229,935 acres were finished during the year, bringing to completion all Stage I Regional Plans along the line of rail. One plan is still outstanding in the Mkushi Intensive Conservation Area. A total of some 3,491,690 acres comprising 53 plans have now been completed to date.

Implementation has followed closely on the approval of plans and by the end of the present financial year priority works within the individual plans will have been completed. The emphasis for implementation will then change to Stage II works with the outstanding Stage I works geared to farm development. Drainage and dam construction received priority in the schedule of works and 16 dams were completed.

Variations to 13 approved plans were accepted. These variations were in respect of additions to existing drainage works to ensure their efficient functioning.

Expenditure or subsidy funds for the 1962/63 financial year was as follows.

Provision : £40,000
Expenditure : £39,892

Details	£	%
Dams	22,513	56.5
Weirs	953	2.4
Waterways	1,625	4.1
Drainage works	4,751	12.0
Roads and crossings	635	1.6
Boreholes	2,735	6.8
Fencing	6,650	16.6
	39,862	100%

The Regional Planning Scheme has been of increasing benefit to European Agriculture over the past decade. It has provided the individual farmer with an appreciation of the soil and water resources of his farm and at the same time a basic reference for development and subdivision proposals. In addition, through the construction of major works, Regional Planning has overcome limitations and provided the framework within which the individual farmer can develop his farm on sound conservation lines.

The Regional Plan works have been of communal benefit by increasing and stimulating the productivity of the individual planned areas. This has been a planned and flexible approach designed to provide the necessary works which have been dictated by conditions peculiar to the individual area. These works have covered water conservation measures through the construction of dams and weirs, major drainage schemes, storm water control, planned access, and fencing and watering points to ensure sound veld management.

b. FARM PLANNING

The emphasis has now moved to farm planning (Stage II) in all areas. Fifteen Stage II Regional Plans were approved. In view of the special circumstances existing in the Copperbelt Intensive Conservation Areas the Minister accepted, on the recommendation of the Natural Resources Board, that for these areas farm plans could be accepted and examined considering both the Stage I and Stage II schedules. Eighteen form plans were completed and photography covering a further 53 plans is on hand.

c. MISCELLANEOUS PLANNING

The Department continued to carry out numerous small-scale investigations for the Agricultural Lands Board. A detailed soil survey is in hand covering some 35,000 acres of an extension to the Mkushi Settlement Scheme.

d. DEBT ADJUSTMENT COMMITTEE OF THE LAND AND AGRICULTURAL BANK OF NORTHERN RHODESIA

The Department continued to advise this committee through a Technical Advisory Committee on which the Department is represented in the person of the Regional Director, who serves as chairman.

e. EASTERN PROVINCE RE-SETTLEMENT SCHEME

The Department assisted the Agricultural Land Board in the resettlement of farmers from the Eastern Province along the line of rail. A considerable number of farms were examined by field staff in order to ascertain their agricultural potential.

E.10. *GOVERNMENT EXPERIMENT FARMS*

a. GENERAL

The policies and programmes of work of the Experiment Farms were discussed with Experiment Farm Advisory Committees and the programmes concerned were satisfactorily implemented. The wet season adversely affected the trials and experiments, especially on the Mochipapa Experiment Farm and the annual field-day related to the cropping programme had to be cancelled.

b. MOCHIPAPA

At Mochipapa this year light rains started on the 7th November. This was followed by good planting rain, but continuous rain during the remainder of November and December gave a total for these two months of 30 in. compared to 11 in. in 1961/62. This pattern of rainfall seriously affected the growth of all crops on the farm and the yields from the experiments were abnormally low.

The beef-breeding herd is now being run on Bye-Gum Acres. This herd will be used to demonstrate aspects of veld management and specific attention will be given to summer weight gains.

A considerable amount of time was spent on the in-service training of staff on the practical aspects of flue-cured, Burley and Turkish production.

Courses were held for in-service trainees and other field staff on the growing, reaping, curing, grading, work study and classification aspects of tobacco and on the building requirements related to tobacco production.

The programme of work for 1963/64 has been laid down and there is no major change in the policy to be followed.

c. CHALIMBANA

The emphasis on the work in progress swung from dry-land cropping to irrigation with outstanding results. A comprehensive demonstration of wheat cultivation including varieties, methods of irrigation and fertilizing was carried out with extremely god results. This aroused a great deal of interest among farmers and showed that wheat can yield in excess of 20 bags per acre provided the variety, water and fertilizer applications are correct.

Lucerne continued to be a mainstay of the dairy herd and except for a six-week period in May 1963, the herd has been supported entirely on home-grown feeds for the last two years. Shortage of lucerne after the summer rains necessitated the use of purchased feeds. A drying plant is being installed on a testing basis.

Summer fattening of three-year-old Angoni cross beef steers took place during the summer. These cattle were approaching their mature liveweight at the beginning of the summer and the results obtained in the feeding trial require further investigation. In brief, the most important aspect of summer fattening appeared to be the treatment they received during the winter prior to fattening. The feeding of 5 lb. corn-and-cob meal during the final fattening period on veld grazing appeared to be no better than veld grazing alone.

Cropping trials during the year included Burley tobacco, maize (variety), soya beans, sunflowers and cotton.

A small planting of *Desmodium intortum* did very well and is to be bulked-up during the coming year. This may well prove to be the dry-land substitute for lucerne. It has several advantages over dhal which has to be grazed and can be utilized only in the winter period.

d. COPPERBELT

The Copperbelt Experiment Farm continued with its main object of investigating the potential of the area for fodder, cash, horticultural and livestock production in this high-rainfall area.

The rainfall this year was slightly below average and all cropping trials were successfully grown. Critical experiments on maize variety, maize fertilizer and liming, soya bean variety and spacing, and groundnut fertilizers were conducted. Yields of maize, soya beans and groundnuts indicate that with good field husbandry this area is capable of producing economic crops.

SR 52 yielded 43.6 bags per acre and soya bean variety Hernon 107 yielded 11.6 bags per acre. The Makulu Red groundnut variety yielded 10 bags per acre.

Burley and Turkish tobacco trials were also carried out, and the quality of tobacco produced was satisfactory. The cigar wrapper trial, while growing and curing well, unfortunately could not be analysed, due to the reapings being mixed.

With the resignation of the Horticultural Farm manager during the year all further trials in the Horticultural Section were discontinued. Part of the original vegetable rotation was retained with the aim of demonstrating suitable rotational crops and growing practices.

A severe frost again damaged the banana and coffee plantings and it has been concluded that these crops are definitely unsuited to this particular area. Pineapples are doing well and the acreage will be increased.

The policy of demonstrating livestock production on the Copperbelt continued. A small Friesland dairy herd was used to demonstrate self-sufficiency in home-grown feeds, using grass leys, irrigated lucerne, legume and maize silage and maize for grain. A sound level of production was maintained with a high degree of self-sufficiency.

Investigations into the carrying capacity of the veld continued and live-weight gains at light stocking rates were as good as gains recorded from recognized ranching areas.

The Angoni breeding herd has done very well and individual animals maintained excellent condition throughout the year.

Two of the four 800-acre paddocks for the four-paddock three-herd system of veld management were completed, and work on the other two continued.

F. CONCLUSION

I would like to take this opportunity of recording my appreciation of the co-operation that this Department has had from the individual Intensive Conservation Area Committees, the Group Committees, the Natural Resources Boards of Southern and Northern Rhodesia during the last ten years and the last year in particular. What we have achieved has been largely due to this co-operation. A very powerful team has been set up and it is a tragedy that this team has now to be broken up to some extent.

Similarly, the assistance and co-operation we have received from the Rhodesia National Farmers' Union, the Farmers' Associations, the Rhodesia Tobacco Association and the Tobacco Research Board and numerous other bodies and organizations have greatly helped us in producing the remarkable progress in Rhodesian agriculture during the last decade.

To my own staff I express my very sincere appreciation of everything that they have done to uphold the traditions of our service and to assist me so admirably during these many difficult and trying years. May I wish them in particular, suitable employment in the future and success in whatever venture they undertake.

J. J. DUVENAGE,
Director of Conservation and Extension.

LIST OF COMMITTEES ON WHICH SENIOR OFFICERS SERVE

The Director, the Deputy Director, or their representative, served on the following committees dealing with matters concerning the Federation:

Federal Standing Committee on Agricultural Production.
Tobacco Research Board.
Maize Industry Development Committee.
Gwebi College Council.
Field Experimentation Committee.
Farm Mechanization Standing Committee.
Rhodesia Agricultural Journal Editorial Committee.
Mashonaland Cattle Council.
Research Advisory Committee.
Seed Stocks Committee.
Hydrological Co-ordinating Committee.
Central African Ploughing Association.

They also served on the following committees concerned with matters pertaining to Southern Rhodesia:

Livestock Improvement Committee.
Natural Resources Board (advisory).
Water Resources Committee of the Natural Resources Board.
Conservation Education Committee of the Natural Resources Board.
Subdivision of Land Committee of the Natural Resources Board.
Tribal Trust Area Committee of the Natural Resources Board (advisory).
General Purposes Committee of the Natural Resources Board.
Sabi Valley High-level Technical Committee of the Natural Resources Board.
Sabi Development Committee.
Sabi Development Farm Advisory Committee.
Sabi Catchment Technical Advisory Committee.
Land Settlement Board.
Bothashof School Council (Government representation).

The Department was also represented on the following committees in Southern Rhodesia:

Y.F.C. National Executive Committee of the Natural Resources Board.
Catchment Protection Committee of the Natural Resources Board.
Young Farmers' Club Regional Executive Committee.
Work Planning Committee of the Tobacco Research Board.
Fertilizer Advisory Committee.
Central African Turkish Tobacco Association.
South-Western Tobacco Marketing Board.
Rhodesia Tobacco Seed Association (Executive and Technical Committees).

The Regional Director and/or his deputy in Lusaka attended meetings of the following committees in Northern Rhodesia during the year:

Farmers' Debt Adjustment Board.
Eastern Province Loans Co-ordinating Committee (chairman).
Tsetse and Trypanosomiasis Committee.
Natural Resources Board (advisory).
African Affairs Sub-committee of the Natural Resources Board.
Drainage Sub-committee of the Natural Resources Board.
Regional Planning Sub-committee of the Natural Resources Board.
Bush Encroachment Sub-committee of the Natural Resources Board.

The Senior Tobacco Extension Officer in Northern Rhodesia served on:

The Eastern Province Loans Co-ordinating Committee.
The Central African Turkish Tobacco Association.

The Senior Animal Husbandry Extension Officer in Northern Rhodesia served on:

The Livestock Improvement Committee (chairman).

Other committees and boards in Northern Rhodesia on which officers served were:

Regional Planning Sub-committee of the Natural Resources Board — Regional Conservation and Extension Officer and Planning Officer (advisory).
Water Board of Northern Rhodesia — Senior Conservation Engineer (member) and Irrigation Officer (advisory).
Copperbelt Lands Advisory Committee — Group Conservation and Extension Officer (advisory).
Northern Rhodesia Irrigation Development Committee — Irrigation Officer, Planning Officer and Regional Conservation and Extension Officer (chairman).
Experiment Farms Advisory Committees — Regional Conservation and Extension Officer (chairman).

In addition, officers attended meetings of councils, commodity committees of the Northern Rhodesia Branch of the National Farmers' Union, and, like their colleagues in Southern Rhodesia, assisted the committees of various agricultural show societies.

PUBLICATIONS

Title	*Author*	*Publication*
1. 'Farm Records to Increase Profits,' Part IV.	G. B. Thorpe	*Rhodesia Agricultural Journal*
2. 'Impact of Duvenage's 1953 U.S. Trip on Rhodesian Agriculture.'	C. K. Thompson	*Rhodesia Agricultural Journal*
3. 'Training 4H and Conservation Education in the United States.'	D. E. Baker	*Rhodesia Agricultural Journal*
4 'Simple Latches for Closing Farm Gates.'	P.R.O.	*Rhodesia Agricultural Journal*
5. 'Gully Control in Mopani Soils'.	N. W. Hudson	*Rhodesia Agricultural Journal*
6 'Conservation, Engineering and Research in the United States of America.'	N. W. Hudson	*Rhodesia Agricultural Journal*
7. 'Beekeeping for Profit.'	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
8. 'How to Avoid Bee Stings.'	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
9. 'Conservation Farming Methods in America's Lower Rainfall Areas.'	G. Rowe	*Rhodesia Agricultural Journal*
10. 'Earth Dam Construction with the Tandem Scoop.'	M. J. Leonard	*Rhodesia Agricultural Journal*
11. 'Lantana Eradication by Manual Means.'	P. E. Anderson	*Rhodesia Agricultural Journal*
12 'Tractor Fuel Records.'	G. B. Thorpe	*Rhodesia Agricultural Journal*
13. 'Protein Supplementary Feeding of Breeding Stock Proves Profitable under Watershed Ranching Conditions.'	T. J. Bembridge	*Rhodesia Agricultural Journal*
14. 'Dealing with the Swarm.'	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
15 'Farm Planning in the United States.'	C. K. Thompson	*Rhodesia Agricultural Journal*
16. 'Velvet Beans for Late Summer and Autumn Grazing.'	J. M. Tweedie and G. W. Carew	*Rhodesia Agricultural Journal*
17. 'Spraying Rig at Gatawa Farm.'	W. W. Soper	*Rhodesia Agricultural Journal*
18. 'Maize: What's the Alternative Crop?' (Serialized).	J. C. Harper	*Rhodesia Agricultural Journal*
19. 'Chipinga's Five Years of Experiments with 30 Dhal Varieties.'	G. W. Carew and G. J. van de Meeburg	*Rhodesia Agricultural Journal*
20. 'American Tour Notes.'	H. Orner	*Rhodesia Agricultural Journal*
21 'American Tour Notes.'	A. J. Collett	*Rhodesia Agricultural Journal*
22. 'Irrigated Winter Wheat — Irrigation and Economics.'	G. Turck	*Rhodesia Agricultural Journal* *(Supplement)*
23. 'Rapoko Grass.'	J. M. Tweedie	*Rhodesian Farmer*
24. 'Beef Cattle Recording.'	T. E. de la Hunt	*Rhodesian Farmer*
25. 'Maize/Sorghum Demonstration.'	A. J. Coast	*Rhodesian Farmer*
26. 'Cowpea and Dolichos Hay Trials.'	A. J. Coast	*Rhodesian Farmer*
27. 'A Simple Cattle Weighbridge.'	J. Cowburn	*Rhodesian Farmer*
28. 'Cotton Advisory Notes.'	A. H. McGregor	*Rhodesian Farmer*
29. 'Mechanisation of Groundnuts.'	A. J. Spear	*Rhodesian Farmer*
30. 'Weekly Tobacco Bulletins.'	Tobacco Branch Staff	*Rhodesian Farmer*

In addition to the above-mentioned items, many other articles were written by members of the Department and published in various newspapers and magazines or in the form of technical memoranda. The Public Relations Officer alone, issued over 400 press releases and feature articles, some of which appeared in every newspaper in the Federation.

APPENDIX III

LIST OF INTENSIVE CONSERVATION AREAS AND GROUPS

SOUTHERN RHODESIA

Region	*Group*	*I.C.A.*
Mashonaland West	Karoi	Karoi South Karoi North Karoi Central Tengwe Vuti
	Sinoia	Angwa North Angwa South Doma
	Banket Ayrshire	Eldorado Banket North Ayrshire South Ayrshire
	Darwendale	Trelawney Darwendale Gwebi-Hunyani
	Umvukwes	Horseshoe Umvukwes Centenary West
Mashonaland East	North Marandellas	Marandellas North Marandellas West Bromley
	South Marandellas	Wenimbi North Wedza South Wedza
	North-East Salisbury	Arcturus Ruwa Salisbury West
	South-West Salisbury	Salisbury South Norton Beatrice
	Mazoe West	Glendale Barwick Marodzi-Tatagura
	Mazoe East	Shamva Bindura Darwin
Matabeleland	Gwaai	Lower Khami Lower Umgusa Upper Khami Upper Umgusa Bubi Inyati
	Shangani	Essexvale Insiza Shangani Mchingwe
	Western	Plumtree Marula Figtree North Matopos Gwaai Matetsi
	Umzingwane	South Matopos Gwanda Filabusi Belingwe-Shabani Limpopo
Midlands	Gwelo	Gwelo East Selukwe Vungu Upper Negesi Gwelo Tokwe

	Que Que	Umniati-Sebakwe
		Bembezaan
		Sessombi
		Battlefields
	Victoria	Chiredzi
		Nuanetsi
		Victoria Central
		Umshandige
		Victoria East
		Sabi Valley
	Umfuli	Selous
		Gadzema
		Suri Suri
		Umsweswe
		Umfuli
		Sokis
	Charter	Gutu
		Chatsworth
		Featherstone
		Enkeldoorn
		Umvuma
EASTERN	South Mid-Eastern	Headlands
		Rusape
		Tsungwesi
		Odzi
	North Mid-Eastern	Mtoko
		Nyandora
		Macheke
		Mayo
	North Eastern	Inyanga
		Umtali North
		Umtali South
		Chinyika
	South Eastern	Cashel
		Chipinga
		Melsetter

TOTAL: 99 Intensive Conservation Areas.

NORTHERN RHODESIA

Group	*I.C.A.*
ZAMBEZI	Livingstone
	Zimba (South Kalomo)
	Kalomo North
	Choma South
	Choma North
MAZABUKA	Monze-Pemba
	Magoye
	Upper Kaleya
	Lower Kaleya
	Mazabuka
	Nega Nega
LUSAKA	Chilanga East
	Chilanga West
	Lusaka West
	Lusaka East
	Lusaka North
CHISAMBA	Chisamba East
	Chisamba West-Mumbwa
	Mwomboshi
BROKEN HILL	Broken Hill South
	Broken Hill North
	Mkushi
COPPERBELT	Chingola-Bancroft
	Ndola-Luanshya
	Kitwe-Mufulira
FORT JAMESON	Fort Jameson

TOTAL: 26 Intensive Conservation Areas.

Appendix IV

MECHANICAL PROTECTION OF ARABLE LAND

SOUTHERN RHODESIA

Region	*Period*	*Contours Ridges and Storm Drains (miles)*	*Bench Terrace (miles)*	*Irrigation Furrows (miles)*	*Drainage Pasture Furrows (miles)*
MASHONALAND . .	1954-55	2,658	1	62	7
	1955-56	3,312	1	52	1
	1956-57	3,327	2	21	—
	1957-58	3,137	1	41	7
	1958-59	3,356	—	24	—
	1959-60	3,528	—	37	—
	1960-61	3,928	—	39	286.3
	1961-62	3,868	2	19	184
MASH. EAST . .	1962-63	2,234	—	*	*
MASH. WEST . .	1962-63	4,052	—	*	*
MIDLANDS . . .	1954-55	1,290	3	43	—
	1955-56	737	5	33	412
	1956-57	703	13	36	24
	1957-58	760	2	22	5
	1958-59	754	6	40	62
	1959-60	708	2	34	24
	1960-61	765	14	49	14
	1961-62	726	17	42	22
	1962-63	784	—	*	*
MATABELELAND .	1954-55	220	3	15	—
	1955-56	104	12	11	14
	1956-57	158	1	11	—
	1957-58	395	9	21	—
	1958-59	350	2	13	1
	1959-60	309	2	22	2
	1960-61	292	0.3	14	—
	1961-62	330	—	9	—
	1962-63	516	—	0.4	*
EASTERN . . .	1954-55	1,792	3	33	8
	1955-56	1,555	12	39	2
	1956-57	1,558	10	56	2
	1957-58	1,818	9	54	—
	1958-59	1,664	5	34	3
	1959-60	1,484	—	63	—
	1960-61	1,494	—	42	—
	1961-62	1,271	—	34	—
	1962-63	2,060	—	41	—
TOTALS	1954-55	5,960	10	153	15
	1955-56	5,708	30	135	429
	1956-57	5,746	26	124	26
	1957-58	6,110	21	138	12
	1958-59	6,124	13	111	66
	1959-60	6,029	4	156	26
	1960-61	6,479	14.3	144	300.3
	1961-62	6,195	19.0	104	206.0
	1962-63	9,646	—	41.4	—

* Denotes a change in the method of assessing statistics. The figures are, therefore, not available in this form.

NORTHERN RHODESIA

Region	*Ridges (Contour) (Yards)*	*Storm Drains (Yards)*	*Roads (Yards)*	*Waterways (Yards)*	*Irrigation Furrows (Yards)*
Kitwe	6,485	300	—	—	—
Chisamba . . .	44,980	26,312	9,320	2,100	900
Lusaka	32,290	40,040	440	16,600	3,780
Mazabuka . . .	52,376	24,850	—	4,000	—
Zambesi . . .	539,859	10,457	115,176	16,832	15,048
Fort Jameson . .	154,490	500	9,625	400	—
Broken Hill . . .	425,887	31,540	21,690	9,100	—
TOTALS:					
1956-57 . . .	913,700	133,800	149,200	—	—
1957-58 . . .	1,175,373	100,673	399,144	50,283	102,618
1958-59 . . .	574,322	135,634	301,600	63,843	39,526
1959-60 . . .	860,145	98,237	306,510	45,018	22,336
1960-61 . . .	728,701	165,383	129,640	59,560	14,647
1961-62 . . .	561,842	45,748	43,433	13,552	8,730
1962-63 . . .	1,256,367	133,999	156,251	49,032	19,728

Appendix V

WATER CONSERVATION STATISTICS

SOUTHERN RHODESIA

Region	*Period*	*No. of Dams*	*Aggregate Capacity (in gallons)*	*Average Capacity per dam (in gallons)*
Mashonaland	1954-55	138	975,140,000	7,066,000
	1955-56	80	621,300,000	7,766,000
	1956-57	72	399,020,000	5,542,000
	1957-58	105	473,928,000	4,513,000
	1958-59	85	605,000,000	7,000,000
	1959-60	163	1,000,499,000	6,138,000
	1960-61	133	1,648,650,000	12,396,000
	1961-62	73	965,770,000	13,228,000
	* 1962-63	63	886,960,000	14,079,000
Midlands	1954-55	101	388,670,000	3,848,000
	1955-56	95	464,705,000	4,892,000
	1956-57	77	781,850,000	10,284,000
	1957-58	84	253,360,000	3,016,000
	1958-59	83	552,590,000	6,657,000
	1959-60	172	1,916,960,000	11,145,000
	1960-61	180	1,471,980,000	8,178,000
	1961-62	94	587,110,000	6,246,000
	1962-63	84	402,010,000	4,786,000
Matabeleland	1954-55	137	649,680,000	4,820,000
	1955-56	153	527,300,000	3,450,000
	1956-57	142	679,200,000	4,783,000
	1957-58	138	832,000,000	6,631,000
	1958-59	208	1,435,630,000	6,902,000
	1959-60	389	2,279,000,000	5,833,000
	1960-61	287	1,729,450,000	6,026,000
	1961-62	91	533,500,000	5,800,000
	1962-63	193	1,567,350,000	8,121,000
Eastern	1954-55	34	149,460,000	4,395,000
	1955-56	25	34,700,000	1,388,000
	1956-57	20	100,565,000	5,028,000
	1957-58	39	23,600,000	605,000
	1958-59	37	103,000,000	3,000,000
	1959-60	54	269,650,000	5,000,000
	1960-61	72	477,530,000	6,632,000
	1961-62	17	73,000,000	4,300,000
	1962-63	36	184,750,000	5,132,000
TOTALS	1954-55	410	2,162,950,000	5,275,000
	1955-56	353	1,648,005,000	4,680,000
	1956-57	311	1,960,635,000	6,304,000
	1957-58	361	1,582,888,000	4,520,000
	1958-59	413	2,696,220,000	5,890,000
	1959-60	778	5,466,109,000	7,026,000
	1960-61	672	5,327,610,000	7,928,000
	1961-62	275	2,159,380,000	7,852,000
	1962-63	376	3,041,070,000	8,088,000

* With the division of Mashonaland into two regions, the total figure should be divided as follows:

Mashonaland East	1962-63	14	255,450,000	18,246,000
Mashonaland West	1962-63	49	631,510,000	12,888,000

BY WHOM DAMS WERE CONSTRUCTED IN SOUTHERN RHODESIA

Year	*Farmers & Contractors*		*I.C.A. Committee Units*		*Government Units*		*Total No.*
	No.	*%*	*No.*	*%*	*No.*	*%*	
1954-55	149	36.0	167	41.0	94	23.0	410
1955-56	130	36.9	84	23.8	139	39.3	353
1956-57	146	46.9	50	16.1	115	37.0	311
1957-58	253	70.1	42	11.6	66	18.3	361
1958-59	286	69.2	32	7.8	95	23.0	413
1959-60	585	75.2	18	2.3	175	22.5	778
1960-61	535	79.6	6	0.9	131	19.5	672
1961-62	242	88.0	4	1.5	29	10.5	275
1962-63	344	91.5	—	—	32	8.5	376

NORTHERN RHODESIA

Period	*Total Number of Dams Constructed*	*Aggregate Capacity (in gallons)*
1956-57	57	128,966,000
1957-58	58	162,290,000
1958-59	38	336,750,000
1959-60	55	558,750,000
1960-61	39	551,750,000
1961-62	55	708,750,000
1962-63	27	490,000,000

BY WHOM DAMS WERE CONSTRUCTED IN NORTHERN RHODESIA

Period Totals	*No.*	*Farmer built Aggregate Capacity (in gallons)*	*No.*	*Government built Aggregate Capacity (in gallons)*
1956-57	10	22,080,000	47	114,886,000
1957-58	17	59,290,000	41	103,000,000
1958-59	12	61,750,000	26	275,000,000
1959-60	9	46,750,000	46	512,000,000
1960-61	13	67,750,000	26	284,000,000
1961-62	6	7,000,000	49	701,750,000
1962-63	3	26,000,000	24	464,000,000

APPENDIX VI

LIST OF FIELD TRIALS CARRIED OUT BY DEPARTMENT OF CONSERVATION AND EXTENSION IN 1962-63

Type	*Matabeleland*	*Mashonaland East*	*Mashonaland West*	*Eastern*	*Midlands*	*Northern Rhodesia*	*Total*
Groundnut fertilizer variety trials	—	3	3	4	5	5	20
Maize fertilizer trials	—	3	3	4	3	7	20
Potato fertilizer trials	—	—	1	—	—	—	1
Sorghum variety/spacings/seed rate trial	1	1	1	—	3	3	9
Soya bean variety trials	2	4	3	1	3	4	17
Castor bean variety trials	—	—	—	—	1	—	1
Cotton fertilizer trials	—	—	—	—	—	2	2
Winter wheat variety trials	—	—	—	—	—	2	2
Horticultural crop trial	—	—	—	1	—	—	1
Liming trials	1	3	2	—	—	—	6
Veld management trials	1	—	—	—	—	1	2
Disease and pest control trials	1	—	—	1	—	1	3
Drainage trials	—	8	1	4	1	—	14
Ridge and furrow trials	—	—	—	—	5	—	5
Livestock trials	3	—	—	—	—	—	3
Virginia Tobacco							
Granville wilt trial	—	—	—	1	—	—	1
In row spacing and nitrogen source trials	—	1	1	1	—	1	4
Liming trials	—	1	—	1	—	—	2
Spacing, topping and suckering trials	—	1	—	—	—	—	1
Burley Tobacco Rates of N.P.K. trials	—	—	—	—	1	2	3
Rates of nitrogen and spacing	—	—	—	—	—	1	1
Turkish Tobacco N.P.K. trial	1	—	—	—	—	—	1
Time of ploughing and rates of nitrogen trial	1	—	—	—	—	—	1
Spacing and fertilizer placement	2	—	—	—	—	—	2
Dates of planting and rates of nitrogen	—	—	—	—	—	1	1
Cigar Tobacco N.P.K. and variety trial	—	—	—	—	—	1	1
Groundnut demonstrations	14	—	2	3	2	—	21
Edible bean variety demonstrations	—	—	4	—	—	—	4
Soya bean variety demonstrations	—	2	2	1	3	1	9
Sunflower variety demonstrations	2	1	—	—	4	—	7
Sunflower fertilizer demonstrations	—	—	—	—	—	2	2
Fodder crop demonstrations	—	—	2	—	3	2	7
Gully control and soil amelioration demonstrations	1	—	—	—	2	—	3
Weed and bush control demonstrations	8	—	1	2	—	5	16
Sundry other demonstrations and observation trials	6	—	8	15	2	13	44
TOTAL	44	28	34	39	38	54	237

APPENDIX VII

DETAILS REGARDING OPERATION OF LIVESTOCK IMPROVEMENT SCHEME

A. SOUTHERN RHODESIA

PURCHASE OF BREEDING STOCK BY THE COMMITTEE ON BEHALF OF FARMERS

1. TOTAL (Cattle)

	1-10-62 to 30-9-63	*1-10-61 to 30-9-62*	*1-10-60 to 30-9-61*
Pedigree bulls	16 for £3,621	10 for £2,388	12 for £2,260
Pedigree females	—	—	—
Grade females	—	—	—
TOTAL	16 for £3,621	10 for £2,388	12 for £2,260

2. DETAILS OF BREEDS PURCHASED

Bulls	*1-10-62 to 30-9-63*	*1-10-61 to 30-9-62*	*1-10-60 to 30-9-61*
Africander	1 for £105	—	1 for £180
Aberdeen Angus	3 for £935	5 for £1,470	3 for £645
Friesland	1 for £350	—	1 for £400
Hereford	7 for £1,468	5 for £918	—
Mashona	—	—	1 for £100
Sussex	4 for £756	—	3 for £420
South Devon	—	—	2 for £300
Shorthorn	—	—	1 for £215.10.0
TOTAL	16 for £3,614	10 for £2,388	12 for £2,260.10.0

	1-10-62 to 30-9-63	*1-10-61 to 30-9-62*	*1-10-60 to 30-9-61*
Females			
Pedigree	—	—	—
Grade	—	—	—
TOTAL	—	—	—

3. SHEEP PURCHASED (Rams and Ewes)

	1-10-62 to 30-9-63	*1-10-61 to 30-9-62*	*1-10-60 to 30-9-61*
Rams			
Dorper	57 for £980	13 for £232	11 for £165
German Merino	3 for £50	1 for £25	—
Suffolk Ram	1 for £50	—	—
South Down	1 for £50	—	1 for £40
Hampshire	1 for £30	—	—
TOTAL	62 for £1,160	14 for £257	12 for £205
Ewes			
Dorper	121 for £795	—	20 for £120
German Merino	5 for £40	—	—
South Down	1 for £25	—	—
TOTAL	127 for £860	—	20 for £120

IMPORTATION OF STOCK FROM THE REPUBLIC OF SOUTH AFRICA

(a) Stock imported by the Committee and farmers combined on Essentiality Certificates issued by the Department of Conservation and Extension, excluding imports on special permits granted by the Republic of South Africa.

	1-10-62 to 30-9-63	*1-10-61 to 30-9-62*	*1-10-60 to 30-9-61*
Pedigree Bulls			
Ayrshire	—	1	—
Aberdeen-Angus	6	8	9
Africander	46	97	80
Brown Swiss	3	—	—
Brahman	2	2	1
Charollaise	—	1	—
Friesland	7	4	8
Guernsey	7	2	—
Hereford	25	60	5
Jersey	4	1	7
Lincoln Red	—	7	—
Limousin	—	2	—
Red Poll	—	1	—
Shorthorn	3	4	4
Sussex	20	22	26
South Devon	4	—	2
Santa Gertruda	—	7	—
TOTAL	127	219	142

	1-10-62 to 30-9-63	1-10-61 to 30-9-62	1-10-60 to 30-9-61
Pedigree Females			
Africander	44	—	12
Aberdeen-Angus	—	21	—
Brahman	—	2 + 2 calves	—
Dexter	—	6 + 2 calves	—
Friesland	4	9	4
Guernsey	—	2	—
Hereford	10	27 + 6 calves	4 + 2 calves
Jersey	—	—	18
Sussex	—	34	15
TOTAL	58	101 + 10 calves	53 + 2 calves
Grade Females			
Friesland	4	1	—
Jersey	3	4 + 1 calf	4
TOTAL	7	5 + 1 calf	4

(b) Stock imported from Republic of South Africa on Special permit issued by the Republic Authorities.

	1-10-62 to 30-9-63	1-10-61 to 30-9-62	1-10-60 to 30-9-61
Pedigree Bulls			
Aberdeen-Angus (Pedigree)	—	—	1
TOTAL	—	—	1
Pedigree Females			
Aberdeen-Angus (Pedigree)	—	—	9
TOTAL	—	—	9
Grade Bulls			
Africander	—	—	10
Jersey	1	—	—
TOTAL	1	—	10
Grade Females			
Africander	—	895 + 275 calves	—
Aberdeen-Angus	—	—	90
Bonsmara	80 + 20 calves	—	—
Hereford	7	—	—
TOTAL	87 + 20 calves	895 + 275 calves	90

CATTLE IMPORTED FROM OVERSEAS

	1-10-62 to 30-9-63			1-10-61 to 30-9-62			1-10-60 to 30-9-61		
	Bull	*Cow*	*Heifer*	*Bull*	*Cow*	*Heifer*	*Bull*	*Cow*	*Heifer*
United Kingdom									
Aberdeen-Angus	5	—	—	—	—	—	—	—	—
Hereford	2	—	2	4	—	—	1	—	—
Friesland	1	—	—	2	—	—	—	—	—
Shorthorn	1	—	—	—	2	—	—	—	—
Jersey	—	—	—	2	—	1	1	—	—
TOTAL	9	—	2	8	2	1	2	—	—
Holland									
Friesland	3	15	—	—	—	—	1	—	—
TOTAL	3	15	—	—	—	—	1	—	—
U.S.A.									
Brahmans	—	—	—	8	10	—	—	—	—
Brangus	—	—	—	2	2	1	—	—	—
TOTAL	—	—	—	10	12	1	—	—	—
GRAND TOTAL	12	15	2	18	14	2	3	—	—

Northern Rhodesia

Essentiality Certificates issued by Livestock Improvement Scheme Committee

Pedigree beef bulls	6
Pedigree dairy bulls	5
Pedigree boars	3
Pedigree gilts	4
Rams	17
Ewes	2

Stock imported into Northern Rhodesia during period 1st October 1962 to 30th September 1963

Pedigree Stock

No.	*Breed*	*Sex*	*Source*
18	Africander	Bulls	Republic of S.A.
2	Hereford	Bulls	Republic of S.A.
8	South Devon	Bulls	Republic of S.A.
1	Jersey	Bull	Republic of S.A.
9	Friesland	Bulls	Republic of S.A.
2	Shorthorn	Bulls	Republic of S.A.
127	Boran	Male and Female	Kenya

N.B. Apparent discrepancy between Essentiality Certificates issued and number of cattle imported due to carry over of Certificates from previous year.

APPENDIX VIII

RECORD OF FORMAL TRAINING SESSIONS ORGANIZED BY TRAINING BRANCH IN CO-OPERATION WITH SPECIALISTS

Dates					*Number Attending*						
From	*To*	*Nature of Course*	*Group opinion*	*Increased understanding*	*Conex Officers*	*Farmers*	*Y.F.C. Leaders*	*Y.F.C. Members*	*Other Departments*	*Commerce and Industry*
15-10-62	16-10-62	Turkish Tobacco			9	—	—	—	—	—
20-10-62	23-10-62	Y.F.C. Leadership . . .			2	—	10	—	—	—
30-10-62	2-11-62	Virginia Tobacco			12	—	—	—	—	—
29-11-62	30-11-62	Turkish Tobacco			(-)	—	—	—	—	—
4-12-62	6-12-62	Public Speaking	78%	3.6	11	—	—	—	—	—
11-12-62	13-12-62	Public Speaking	93%	4.1	11	—	—	—	1	—
11-12-62	13-12-62	Virginia Tobacco			(-)	—	—	—	—	—
17-12-62	21-12-62	Pests and Weeds	83%	2.7	8	—	—	—	5	—
22- 1-63	1- 2-63	Conservation Course II .	73%	2.2	17	—	—	—	4	—
24- 1-63	25- 1-63	Farm Pl. Refresher, Umtali	80%	—	19	—	—	—	4	—
4- 2-63	5- 2-63	Turkish Tobacco			—					
12- 2-63	14- 2-63	Extension Methods, Umtali	80%	2.1	14	—	—	—	3	—
12- 2-63	14- 2-63	Vegetation Survey, Byo .	—	–	16	—	—	—	—	—
4- 2-63	15- 2-63	Virginia Tobacco, Mochipapa	85%	3.6	—	—	—	—	—	—
18- 2-63	22- 2-63	Land Classification (Topographers)	—	—	6	—	—	—	—	—
26- 2-63	27- 2-63	Vegetation Survey, Gwelo .	—	—	21	—	—	—	—	—
25- 2-63	27- 2-63	Extension Methods, Lusaka	83%	2.3	8	—	—	—	5	—
28- 2-63	2- 3-63	Extension Methods, Lusaka	84%	2.8	11	—	—	—	5	—
5- 3-63	15- 3-63	Irrigation	71%	2.4	12	—	—	—	3	—
18- 3-63	20- 3-63	Extension Methods, Que Que	82%	2.2	5	—	—	—	4	—
21- 3-63		Turkish Tobacco			(-)					
21- 3-63	23- 3-63	Extension Methods, Gwelo	90%	2.5	8	—	—	—	3	—
26- 3-63	28- 3-63	Extension Methods, Byo. .	82%	1.5	10	—	—	—	5	—
1- 4-63	3- 4-63	Farm Machinery	61%	3.0	8	—	—	—	1	
3- 4-63	5- 4-63	Farm Buildings	60%	2.4	8	—	—	—	1	
8- 4-63		Training Methods (Com. and Ind.)	84%	—	2	—	—	—	4	9
16- 4-63	26- 4-63	Conservation Course I . .	82%	2.8	23	—	—	—	3	—
18- 4-63	19- 4-63	Farm Planning Refresher—Salisbury	—	—	18	—	—	—	—	—
1- 5-63	3- 5-63	Extension Methods, Sby. .	79%	2.8	8	—	—	—	8	—
8- 5-63	10- 5-63	Extension Methods, Sinoia	85%	2.2	14	—	—	—	3	—
13- 5-63	17- 5-63	Virginia Tobacco	—	—	—	—	—	—	—	—
10- 6-63	11- 6-63	Farm Pl. Ref., Sinoia . .	—	—	14	—	—	—	—	—
10- 6-63	11- 6-63	Farm. Man. Dev., Salisbury	—	—	13	—	—	—	—	—
13- 6-63	13- 6-63	Farm Man. Dev., Sinoia .	—	—	14	—	—	—	—	—
13- 6-63	14- 6-63	Farm Pl. Ref., Lusaka . .	—	—	15	—	—	—	4	
15- 6-63		Y.F.C. Training Rally (Mashonaland)			4	—	13	280		
18- 6-63	28- 6-63	Conservation Course III .	—	—	11	—	—	—	8	—

24- 6-63	25- 6-63	Farm Man. Dev., Gwelo	—	—	10	—	—	—	—	—
27- 6-63	28- 6-63	Farm Man. Dev., Byo.	—	—	14	—	—	—	—	—
1- 7-63	3- 7-63	Public Speaking	90%	2.8	2	—	—	—	9	—
10- 7-63	13- 7-63	Y.F.C. Administration (N.R.)					50	—	—	—
11- 7-63	12- 7-63	Farm Man. Dev., Umtali			12	—	—	—	—	—
16- 7-63	17- 7-63	Farm Man. Dev., Lusaka			12	—	—	—	—	—
23- 7-63	26- 7-63	Farm Management			8	—	—	—	6	—
23- 7-63	26- 7-63	Beekeeping			8	—	—	—	—	—
27- 7-63		Y.F.C. Training Rally (East Reg.)					4	96	—	—
30- 7-63	2- 8-63	Beekeeping			4				2	—
30- 7-63		Y.F.C. Leadership (Midlands)					8			
1- 8-63		Y.F.C. Training Rally (Midlands)			2		6	150		
3- 8-63		Y.F.C. Leadership (Mashonaland)					15			
6- 8-63	16- 8-63	Conservation Assistants			16	—	—	—	—	—
20- 8-63	30- 8-63	Conservation Assistants			18	—	—	—	—	—
3- 9-63	6- 9-63	Work Study	83%		12	—	—	—	—	—
17- 9-63	18- 9-63	Burley Tobacco, U.C.R.N.				140				
27- 8-63		Y.F.C. Leaders' Evening (Midlands)					10	—	—	—
28- 8-63		Y.F.C. Training Rally (Matabeleland)			3		4	80	—	—
29- 8-63		Y.F.C. Leadership (Matabeleland)					8			
29- 8-63		Beekeeping—Salisbury	—	—	6	—	—	—	—	—
1-10-63	2-10-63	Beekeeping—Salisbury	—	—	1	—	—	—	3	—
3-10-63	4-10-63	Virginia Tobacco—Salisbury	—	—	—	65	—	—	—	—
8-10-63	10-10-63	Extension Methods	92%	—	—	—	—	—	20	—
16-10-63	18-10-63	Training Methods	89%	3.0	—	—	—	—	20	—
21-10-63	25-10-63	Virginia Tobacco—B'Hill	—	—	—	29	—	—	—	—
22-10-63	24-10-63	Extension Methods	74%	2.0	20	—	—	—	—	—
4-11-63	6-11-63	Extension Methods	90%	2.8	15	—	—	—	2	—
7-11-63	9-11-63	Tobacco Buildings	—	—	12	—	—	—	2	—
12-11-63	13-11-63	Beekeeping	—	—	1	—	—	—	5	—
19-11-63		Beekeeping (Refresher)	—	—	9	—	—	—	—	—
18-11-63	22-11-63	Training Methods	—	—	14	—	—	—	2	—
25-11-63	29-11-63	Training Methods	—	—	13	—	—	—	7	—
					574	234	128	606	154	9

TOTAL COURSES = 70
ATTENDANCE = 1,705

APPENDIX IX

ADVISORY VISITS 1ST OCTOBER 1962—30TH SEPTEMBER 1963

SOUTHERN RHODESIA

Purpose of visit	*Mashonaland East*	*Mashonaland West*	*Matabeleland*	*Midlands*	*Eastern*	*Total*
Meetings						
1. I.C.A. Group	332	347	247	358	242	
2. Farmers' association	105	40	61	104	55	
3. Road Councils Boards	23	31	7	21	22	
4. Staff conferences	302	146	97	174	112	
5. Courses	329	259	179	274	118	
6. Conservation and Youth Education	35	26	29	67	100	
7. Official Boards	14	16	8	9	35	
8. Other	164	82	41	92	79	
TOTAL	1,304	947	669	1,099	763	4,782
Inspections						
1. Water Court/Board	88	60	16	58	93	
2. Land Settlement	26	108	22	14	23	
3. Land Subdivision	44	46	14	25	17	
4. Livestock	123	39	51	78	100	
5. Crops (including seeds)	212	76	31	246	67	
TOTAL	493	329	134	421	300	1,677

Advisory and Pegging						
1. Agronomy, including veld and pasture	662	639	349	1,316	658	
2. Tobacco	1,113	1,047	443	916	1,553	
3. Livestock — beef	299	202	469	598	166	
4. Livestock — dairy	57	12	98	223	60	
5. Livestock — other	25	25	24	41	21	
6. Drainage	204	56	21	81	49	
7. Irrigation	181	66	237	381	179	
8. Conservation and Youth Education	46	13	41	57	106	
9. Soil conservation	1,188	1,699	317	797	1,008	
10. Dams and weirs	303	732	540	747	396	
11. Regional and farm planning	674	758	268	259	414	
12. Roads	169	191	33	98	62	
TOTAL	4,921	5,440	2,840	5,514	4,672	23,387
Other visits						
1. Tobacco research stations	97	92	29	36	50	
2. Other research stations	98	56	50	55	62	
3. I.C.A. matters	403	315	280	310	388	
4. Field-days/discussion groups — general	176	152	123	193	134	
5. Field-days/discussion groups — tobacco	104	123	21	85	63	
6. Miscellaneous tobacco visits	120	128	38	21	94	
7. Agricultural shows	147	44	42	183	93	
8. With specialists	375	254	117	425	241	
9. Field-trials	400	321	271	584	295	
10. For official boards	14	14	46	16	17	
11. Other visits	423	698	127	513	526	
TOTAL	2,357	2,197	1,144	2,421	1,963	10,082
GRAND TOTALS	9,075	8,913	4,787	9,455	7,698	39,928

In October and November 1963, a total of 7,169 visits were made before the Department became Territorial.

NORTHERN RHODESIA

Meetings	
I.C.A./Group	276
Farmers' association	52
Road Councils/ Boards	54
Staff conferences	172
Courses	204
Conservation and youth education	37
Official Boards	125
Other	264
Inspections	
Water Court/Board	41
Land Settlement	43
Land Subdivision	9
Livestock	270
Crops — including seeds	104
Advisory and Pegging	
Agronomy, including veld and pastures	608
Tobacco	1,489
Livestock — beef	393
Livestock — dairy	210
Livestock — poultry	430
Drainage	424
Irrigation	804
Conservation and youth education	52
Soil conservation	415
Dams and weirs	352
Regional and farm planning	764
Roads	140
Other Visits	
Tobacco research stations	87
Other research stations	267
I.C.A. matters	168
Field-days/Discussion groups — General	193
Field-days/Discussion groups — Tobacco	57
Miscellaneous tobacco visits	104
Agricultural shows	162
With specialists	610
Field-trials	346
For Official Boards	158
Other visits	1,045
Office—general	74
Total visits	11,009

During the last two months of the Federal period (October and November 1963), officers of the Department made 1,942 visits.

APPENDIX X

NORTHERN RHODESIA

REGIONAL PLANS COMMENCED DURING THE THREE-YEAR EXPERIMENTAL PERIOD ENDING 30TH JUNE 1957

Area and Plan Name and Number	*Acreage*	*Commencement Date*	*Completion Date*
Upper Kaleya (Upper Kaleya/2) .	7,728	1. 6.54	31. 5.58
Upper Kaleya (Middle Kaleya/4) .	57,884	1. 6.54	31. 5.58
West Lusaka (Cheta River/1) . .	31,121	1. 9.54	31. 8.58
Chilanga (Chilongola/3) . . .	61,009	1. 9.54	31. 8.58
North Broken Hill (North Broken Hill/5)	110,161	1. 5.55	31.10.58
Lower Kaleya (Lower Kaleya/6) .	70,124	1. 8.55	31. 7.58
East Lusaka (Chalimbana/7) . .	100,729	1. 7.56	30. 6.58
Mazabuka (Mazabuka/8) . . .	116,987	1.10.56	30. 9.59
	555,742		

In addition to the above, 10,053 acres were planned in 1952-53 in the Upper Kaleya Pilot Scheme, bringing the total acreage up to 30th June 1957 to 565,795.

REGIONAL PLANS COMMENCED SUBSEQUENT TO THE 30TH JUNE, 1957, UNDER THE OLD FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Commencement Date*	*Completion Date*
North Kalomo (Mukwela/10) .	40,491	21. 1.58	20. 1.61
South Broken Hill (Munga River/11)	41,116	21. 4.58	20. 4.61
Zimba (Bowood East/9) . . .	68,150	5. 8.58	4. 8.61
	149,757		

PLANS COMMENCED SUBSEQUENT TO THE 30TH JUNE, 1957, UNDER NEW FEDERAL CONDITIONS UP TO 30TH SEPTEMBER, 1959

Area and Plan Name and Number	*Acreage*	*Date Approved*
West Lusaka (Molendemo N.W/12).	21,264	30.10.58
South Choma (Sibanyati/24) . .	30,000	15. 1.59
North Lusaka (Lower Chongwe/50)	72,000	30. 5.59
Monze-Pemba (Kazangula/33) . .	45,000	30. 6.59
Magoye/Lower Kaleya (West Kaleya/39)	26,258	20. 6.59
Livingstone (Matetse/15) . . .	48,276	19. 6.59
Mwomboshi (Miswa/56) . . .	50,000	21. 8.59
Livingstone (Maramba/14) . . .	68,746	31. 7.59
South Broken Hill (Nyama West/58)	64,132	4. 9.59
Nega Nega (Lusito/40) . . .	29,102	31.10.59
East Chisamba (Malo/54) . .	51,537	15.11.59
	506,415	

REGIONAL PLANS COMPLETED FROM 1ST OCTOBER, 1959, TO 30TH SEPTEMBER, 1961, UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
North Choma (Upper Mbabala/27) .	56,920	20. 5.61
Chilanga (Lilayi/45) . . .	71,900	22. 2.61
West Chisamba (East Wangwa/52) .	78,381	1.12.60
Zimba (Bowood Luezi/17) . .	102,834	9. 5.60
North Kalomo (Kalomo/21) . .	82,501	2. 5.60
Monze-Pemba (Demu/31) . . .	46,770	1. 3.60
Magoye (Magoye/37) . . .	79,043	24. 9.60
West Lusaka (Molendemo West/46)	50,856	1. 8.60
East Lusaka (Mwanza/48) . .	53,808	22. 7.60
East Chisamba (Upper Chongwe/53).	37,711	20. 7.60
South Broken Hill (Nyama/57) .	49,402	11. 8.60
Chilanga (Dem/44)	91,670	12. 6.61
Nega Nega (Nega Nega/41) . .	154,767	29. 4.61
North Kalomo (Mweba/20) . .	129,784	15. 6.61
West Chisamba (West Wangwa/59) .	73,802	3.12.60
	1,480,980	

REGIONAL PLANS COMPLETED SUBSEQUENT TO THE 30TH SEPTEMBER, 1961, UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
Livingstone (Sinde/13)	20,400	10. 1.62
Monze-Pemba (Monze/36) . . .	89,661	20. 5.61
North Lusaka (Ngwerere/49) .	46,353	11. 9.61
South Choma (Tara Batoka/30) .	129,900	28. 9.61
Upper Kaleya (Mbaya/38) . .	34,317	10. 5.62
Zimba (Ngwesi/18)	53,016	30. 7.62
North Kalomo (Chilesha/19) . .	67,304	24. 8.63
North Choma (Sibanyati West/26) .	61,388	13. 8.62
Monze-Pemba (Chisekesi/34) . .	34,632	3. 9.62
Chilanga (Shimbabala/43) . .	84,614	25. 5.63
West Lusaka (Chunga/47) . .	75,459	17. 1.63
Mwomboshi (Mulembo/55) . .	38,100	27. 8.63
Mkushi (Mumshiwemba/60) . .	143,695	24. 8.63
	558,808	

REGIONAL PLANS COMPLETED SUBSEQUENT TO THE 30TH SEPTEMBER, 1962, UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
North Choma (Mbabala/28) .	62,874	Not yet approved
North Choma (Sikalonga/29)	94,503	Not yet approved
West Chisamba (Lower Wangwa/51) . . .	72,558	19.9.63
TOTAL . .	229,935	

Total Area Planned 3,491,690 acres.

REGIONAL PLANS BEING WORKED ON IN NORTHERN RHODESIA
Mkushi (Mkushi/61)

Department of Veterinary Services Report for the Period 1st October, 1962 to 30th November, 1963

DEVELOPMENT AND PROGRESS has again been retarded by shortage of professional staff, especially in the Research Branch where there were vacancies for three Research Officers, and in the Tsetse and Trypanosomiasis Branch, with three unfilled Entomological posts.

In the Field Branch, the establishment is being gradually filled by qualification of bursary students, under the Government-aid scheme, and it should be possible to sustain this position.

A 'crash' training scheme of Meat Inspectors in Scotland was duly finalized and six men are now training in Glasgow under Government auspices.

Lay staff was augmented by five, to give veterinary cover to cattle being settled in the proximity of tsetse fly-belts.

The Wild Life Research Officer has been able to accumulate an imposing mass of specimens, physical and pathological, from free-living wild life from rescue operations, etc., but owing to staff shortage in the Research Branch, the major part of these have had to be distributed on a world-wide basis to interested laboratories for examination and report, and this has slowed down progress.

DISEASES

FOOT-AND-MOUTH DISEASE

The country remained free from foot-and-mouth disease during this period. Major advancement was achieved in the erection of game-proof fencing on the Colony's borders and around the Wankie National Park, combined with strategic internal barbed wire cattle-proof fences, all serviced by permanent patrol roads and fence-guards. The Department of Wild Life Conservation actively co-operated in shooting along the game-proof fences and as a result wild life has rapidly learnt to respect their function. Elephant still wreak destruction to the fences, especially in the dry season, but experimentation in the provision of grids for elephant only to cross the fences bears promise of a successful solution.

The fencing programme is gradually achieving the desired objective of mass cleavage between free-living ungulates and domestic stock, thereby drastically reducing the incidence of foot-and-mouth disease in the border areas, and the Federal Government's support of this policy has been fully justified.

TSETSE AND TRYPANOSOMIASIS

With the sustained high rainfall persistence of arboreal shade, etc., over the major part of winter the threatening advance of tsetse fly, common to Central Africa in the last five years, has continued and major combined exercises of bush-clearing, insecticidal spraying and prophylactic drug régimes in cattle have had to be mounted in an all-out effort to hold the position.

In addition, a policy has been adopted, in collaboration with the Southern Rhodesia Department of Internal Affairs, of establishing settlement areas within or adjacent to the known fly-belts after the building of access roads and limiting fences on the perimeters. Cattle are being maintained within them under prophylactic drug cover, and agricultural activities are being fostered to disrupt the fly-habitat. The combined spraying operations in the south-east in which the Department was joined by the Republic of South Africa and Moçambique authorities, are showing promise of success after two campaigns.

Research within the Tsetse and Trypanosomiasis Control Branch has materially increased, and sustained advance in biological knowledge of the tsetse fly and in the use of prophylactic and/or curative drugs in domestic stock is recorded.

RABIES

This has stabilized as a border problem, mainly in the east. Thirteen positives in non-vaccinated dogs, principally strays, with four fatal human involvements were recorded. The rabies cover within the country has had to be vigorously reinforced in the face of non-production of dogs for vaccination by rural populations. No breakdowns in vaccinal cover in the main canine population have occurred.

TUBERCULOSIS

With 41.7 per cent. of the European dairy cattle now under sustained tuberculin testing, the tuberculosis incidence figure of 0.19 per cent. can be accepted as statistically significant, especially when co-related to the recurring abattoir incidence of 0.15 per cent.

AFRICAN SWINE FEVER

This disease was confirmed in the south-west of the Colony adjacent to a recognized area of incidence in the Northern Transvaal. An area of 480 square miles was completely cleared of domestic pigs, by slaughter and burning of all carcasses as an eradication policy.

In view of the reservoir problem in feral pigs, consideration will have to be given to the compulsory restriction of domestic pigs within housing or pig-proof paddocks as a general measure.

CONTAGIOUS ABORTION (Brucellosis)

Compulsory vaccination of all heifer calves is being undertaken in small localized areas as a basis for the attempted future eradication of this disease. Milk-ring test of bulk deliveries at Salisbury gave a figure of 13 per cent. of suppliers with brucella antigens in their milk and biological investigation of the positive premises is now due to take place. The toleration of the existence of a major erosive factor of this type cannot be justified in a progressive livestock industry, and an eradication scheme should be considered in conjunction with tuberculosis.

WILD LIFE RESEARCH

The formation of a conjoint committee with the Department of Wild Life Conservation for full co-ordination of the activities of the respective Wild Life Research Officers of the two departments has secured economical co-operation in objectives and research.

The whole question of marketing of carcasses from wild life ranches, especially in regard to a possible canning industry, is under active investigation.

DIAGNOSTIC SERVICES

FIELD BRANCH

Attention is drawn to the enhanced usage of these services at district level. The need for small investigational units on a local basis with a laboratory and technical staff is very obvious.

The provision of technicians could free professional officers for more gainful employment.

VETERINARY RESEARCH BRANCH

Despite staff shortage, major diagnostic services were satisfactorily maintained and several investigational projects accomplished.

The appointment of a Tick Biologist under FAO aegis for a period of three years should add considerably to the Department's knowledge and improvement in tick-control measures in years to come.

The efficiency of the Artificial Insemination Service has been enhanced by the adoption of liquid nitrogen for deep freezing of semen, but with only 4 per cent. of dairy cattle participating in the scheme, it is apparent that it will have to be handed over to private enterprise if any extension is to be achieved.

A poultry disease survey is in the process of being completed and its final findings should be of value to this industry in assessing the true factors in flock wastage.

DEPARTMENTAL SURVEYS

A close examination of the organization and services of the Department's three Branches was made by three international authorities during the year, viz:

Mr. W. D. Macrae, Deputy Chief Veterinary Officer, Animal Health Division, Great Britain, in relation to his country's acceptance of the Colony's animal and vegetable export products.

Mr. D. N. Reid, Chief, Section of Tropical Medicine, Animal Production and Health Division, FAO, in relation to the efficiency of the Department's service.

Dr. Alexander (ex Director of the Veterinary Services of the Republic of South Africa), as an FAO consultant on research requirements.

It is gratifying to record that the Department was generally recognized as showing a high degree of efficiency in organization and disease control.

Such surveys underline the vital necessity of maintaining an effective veterinary service for purposes of decimative disease control, this being the mainstay of the ready acceptance of the Colony's animal and vegetable exports by the rest of the world.

CONFERENCES

The following were attended during the year:

Annual Congress of the International Office of Epizootics.
Biannual Conference of Food and Agricultural Organization.
Inter-territorial Foot-and-mouth Disease Conference.
Wild Life Research Inter-territorial Committee.
World Veterinary Congress.
South African Veterinary Association.
The International Congress of Tropical Medicine and Malaria.
Meeting of Experts on Trypanosomiasis CCTA/CSA.

The emerging importance of the International Office of Epizootics as the main international disseminator of records of incidence of disease and as the final forum wherein the acceptance of any country's animal and vegetable exports by other countries is recommended or otherwise, cannot be overstressed and its decisions underline the international importance of the necessity of a sound veterinary service in any exporting country.

Its decisions and deliberations influenced discussions at practically every other conference attended.

VETERINARY FIELD BRANCH

STAFF

The Field Establishment had one vacancy at the end of the year.

Five new appointments included three veterinary surgeons with approved continental degrees. The future of the Branch appears more assured with a steady flow of newly qualified Rhodesian veterinary surgeons as from December 1963, under the State-aided bursary scheme of training. Twenty-seven veterinary surgeons were actively employed in private practice, and two in commercial employment.

ANIMAL HEALTH INSPECTORS

The establishment was increased by five in July 1963, to effect prophylactic control of cattle being settled in new marginal areas adjacent to tsetse fly belts.

New appointments	21
Superannuation	1
Resignations	15

Great difficulty is experienced in obtaining and retaining staff to occupy out-stations, the competition from ranchers, etc., for such employees being great, especially after they have received a basic veterinary training.

MEAT INSPECTORS

Three vacancies still existed despite widespread advertising. A scheme for crash training of young Rhodesians as qualified meat inspectors in Scotland was finalized and six men proceeded overseas in October 1963.

GENERAL

CLIMATE, FOOD AND WATER SUPPLIES, CONDITION OF STOCK

The year opened with widespread water shortages, limited grazing and little available browse, complicated by widespread veld fires. Loss of condition in stock was rapid and poverty deaths numerous, especially in the eastern highveld and south-west lowveld where near-drought conditions prevailed, as in the past two seasons.

Heavy soaking rains fell in November 1962, and continued unabated until mid-January 1963, when a three-week dry spell supervened. Thereafter, good rains in February, showers in March and late rains in April gave a favourable season with rivers and dams fully replenished. General veld grazing was in excellent heart by February, except in Beitbridge and West Nicholson areas, where local rains were poor and near-drought conditions prevailed.

Rank growth in the waterlogged veld, complicated by widespread ephemeral fever outbreaks, held stock back severely until February. Thereafter drier conditions and abundance of water and grazing ensured a better-than-normal stock season for most of the country, and cattle went into the winter in a favourable forward condition.

From May onwards, a long sustained period of cold nights and severe frosts took heavy toll of grazing and condition. A marked increase in supplementary feeding and verminosis control offset this adverse period and no undue poverty deaths were recorded.

Supplementation of nutrition in breeding herds was generally increased and a higher calving percentage should follow.

Veld fires again took toll of many acres of grazing at the close of the season and early rains are required to restore the balance of available feed.

TICK LIFE AND DIPPING

The widespread water shortages at the beginning of the season, followed by incessant rains, interfered adversely with general tick control by dipping, but in February satisfactory overall control had been re-established.

This gap in sustained tick destruction was reflected in many tick-infested areas, later in the season, with the usual ill-founded allegations of emerging arsenic-resistant ticks.

The situation was also disadvantageously exploited by many ranchers securing immediate disinfestation of stock by dipping in organo-phosphates when rains ceased. Herds were then not dipped at weekly intervals, in view of the marked disinfestation, but at much longer intervals. The build-up of infestation by multi-host ticks by this procedure was soon apparent and the necessity of short-term dipping in the tick flush season has had to be strongly enforced with numerous quarantines.

The swing away from arsenical dip, a proven safe, cheap and efficient tick-control factor in competent hands, has been accelerated by malicious poisonings of stock by this agent. Addition of marker dyes to the concentrate is being effected by all producers of this type of dip in order to defeat this danger, but it should be strongly stressed that the most effective deterrent is in the storing of such poisons under lock and key as required by law.

Toxaphene dips are in wide usage, especially where bont (*Amblyomma* sp.) and bont-legged ticks (*Hyalomma* sp.) occur and sevin (carbamate) preparations are increasing in scope.

Abuse in the field of such organics, in the shape of reluctance to maintain effective replenishment due to the expense factor, is rapidly denigrating their effectiveness and can only lead to emerging problems of resistance.

The efficiency of arsenic as a sheet anchor in tick control by dipping tanks, cannot be overstressed in comparison to the high-priced but selective organic acaricides.

QUARANTINE NOTICES

Veterinary Districts: Bulawayo 272, Salisbury 431, Fort Victoria 200, Gwelo 442, Umtali 110, Chipinga 129, Sinoia 120, Gwanda 121 — Total: 1,825.

CONTRAVENTIONS

District	*Animal Health Act*	*Animal Health Regulations*	*Cruelty Act*	*Law & Order Maintenance Act*	*Stock Thefts Act*	*Pounds and Trespasses Act*	*Total*
Bulawayo	344	77	—	1	—	—	422
Salisbury	1	141	5	—	—	—	147
Fort Victoria	26	264	—	—	—	—	290
Gwelo	16	218	6	—	—	—	240
Umtali	5	202	1	—	—	—	208
Chipinga	48	44	—	—	—	—	92
Sinoia	62	—	5	—	—	—	67
Gwanda	177	197	—	—	6	2	382
	679	1,143	17	1	6	2	1,848

LIVESTOCK INSPECTIONS

The total number of cattle inspected by members of staff during the year, under the Animal Health Act, was 23,700,891.

SPECIFIED DISEASES

VIRAL AND RICKETTSIAL DISEASES

Foot-and-Mouth Disease

No outbreaks occurred in the Territory during the agricultural year.

In July 1963, the disease was reported in Bechuanaland Protectorate and all importations of animals and animal products therefrom were prohibited until further notice.

Intensive inspections of all stock in the adjoining areas of Southern Rhodesia were immediately amplified and patrols of the cattle and game fences on the western borders increased.

A survey of wild life on this border by the staff of the National Parks Department was immediately effected but no disease was apparent.

The game fence on the north-west border from the Zambezi River south to the top of the Wankie National Game Park, and thence along its northern border to the east, was completed (10-strand high-tensile steel wire, 7 ft. high on 6 in. minimal butt wooden poles 15 ft. apart, length 120 miles). This fence is supplementary to the 180 miles of game fence erected on the east and south-east borders of the Wankie National Game Park and a further 128 miles of barbed wire cattle control fences erected on the western border.

A similar game fence is also in process of erection along the south-east Moçambique/Southern Rhodesian border with financial co-operation from the Moçambique authorities.

These fences are proving a sound prophylactic measure in the control of foot-and-mouth disease, in effecting mass cleavage between free-living wild life (especially antelope) and domestic stock.

The need for continuous maintenance and patrolling of these fences, however costly, is well justified.

RABIES

The following cases were confirmed during the year:

Native District	*No. of Cases*	*Species*	*Vaccination Status*
Chipinga	5	Dogs	Unvaccinated Strays
Ndanga	2	Dogs	Unvaccinated Pups
Buhera	1	Dog	Unvaccinated Stray
Umtali	2	Dogs	Unvaccinated Strays
Darwin	2	Dogs	Unvaccinated Adult Unvaccinated Stray
Mtoko	1	Dog	Unvaccinated Stray
TOTAL	13	Dogs	Unvaccinated

Two Africans in Darwin District, one African in Bikita District and one from Ndanga District died from rabies after being bitten by stray dogs and not submitted to treatment. All four brains were histologically positive.

An African woman died from shock after being mauled by a rabid hyaena in the Darwin area.

It is a sad reflection on the mentality of political agitators that they should foment resistance to the free vaccination of dogs at such a risk to their fellow men.

Again it must be recorded that this disease has firmly established itself as a problem in the border areas adjoining Moçambique.

Only 120,543 dogs were vaccinated in contrast to 364,976 dogs last year.

Strays totalling 202 were destroyed.

Total vaccinations since July 1951 now total 1,708,960 and no positives were recorded except in the eastern border areas.

Prosecutions for non-production of dogs for vaccination in the Tribal Trust Areas had to be intensified towards the end of the year.

Contagious Epdidymitis and Vaginitis

This disease still remains in a few (seven) ranching properties where, because of its low economic significance, no efforts are made towards its elimination. Bull inspection on all large ranching properties on introduction and withdrawal from breeding herds was continued as a control measure.

Lumpy Skin Disease

Only a few cases were recorded generally during the year. A severe outbreak in the Makoni District, involving dairy stock, was immediately and successfully controlled by vaccination (Neethling type) of the affected herd and of other herds in the immediate environs. Except for 20 per cent. of the first herd involved, no adverse results were recorded.

African Swine Fever

Heavy mortality in native pigs was reported in the Siyoka and Dendele Tribal Trust Lands in the south-west.

Specimens from the area revealed the presence of African Swine Fever.

985 pigs were established as having died and 1,547 surviving pigs in these areas were slaughtered and burned, with compensation.

The surrounding areas were placed in quarantine and movements of pigs controlled by road blocks and cordons.

BACTERIAL DISEASES

Anthrax

No outbreaks occurred during the year.

Following the report of anthrax deaths amongst impala in the contiguous Kruger Game Park, Republic of South Africa, 13,372 cattle were vaccinated in Sengwe Tribal Trust Lands as a prophylactic measure.

Tuberculosis

(a) Imports tested, 2,247 — No reactors.

(b) Exports tested, 1,029 — No reactors.

Tuberculin Test Herds

The following tests of dairy herds were performed:

Veterinary District	*No. of Herds*	*No. of Cattle*	*No. of Reactors (1962/63)*
Salisbury	153	9,304	1
Bulawayo	59	5,846	50
Umtali	54	969	—
Gwelo	34	3,291	1
Fort Victoria	30	1,493	2
Sinoia	22	2,524	34
Chipinga	5	26	—
Gwanda	3	211	—
	360	23,664	88 0.33 %

Total Dairy Herds under Testing Agreements and their respective status were:

Veterinary District	*Totals Attested Non Attested*		*Attested*		*Non-Attested*	
	No. of Herds	*No. of Cattle*	*No. of Herds*	*No. of Cattle*	*No. of Herds*	*No. of Cattle*
Salisbury	247	25,181	202	16,121	45	9,060
Bulawayo	75	8,047	63	6,586	12	1,461
Umtali	54	5,105	50	4,583	4	522
Gwelo	34	2,743	18	2,120	16	623
Fort Victoria	24	1,853	20	1,623	4	230
Chipinga	23	1,438	22	1,431	1	7
Sinoia	14	1,811	8	1,124	6	687
Gwanda	10	713	8	696	2	17
	481	46,891	391	34,284	90	12,607
				73.1%		26.9%

Despite propaganda, several herd owners still prefer to remain on the old voluntary scheme as the compensation scheme has a few regulatory strictures for better veterinary control.

Districts	*Voluntary Scheme*	*Compensation Scheme*
Salisbury	—	249
Bulawayo	25	50
Umtali	14	40
Gwelo	7	27
Fort Victoria	—	24
Chipinga	—	23
Sinoia	3	11
Gwanda	—	8
	49	432

Voluntary Scheme(Beef Herds)

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1962-63*
Salisbury	5	5,382	1
Bulawayo	1	163	—
Sinoia	1	154	—
	7	5,699	1

Summary Agreement Testing

Dairy Herds:

Total Dairy Herds	481
Total Cattle Under Test	46,891
Total Reactors, 1962-63	88 = 0.19%

Beef Herds:

Total Herds	7
Total Cattle Tested	5,699
Total Reactors, 1962-63	1

The rise in reactors came mainly from the enforced testing of two herds after animals had been condemned for generalized Tuberculosis at the Cold Storage Commission abattoirs. Thirty-eight reactors were derived from one herd alone, twenty-seven being condemned as generalized. The other herd on initial test yielded thirteen generalized condemnations from sixteen reactors.

For various reasons 53 cattle were tested producing no reactors.

In regard to the ranch in Matabeleland where annual testing had been practised since 1953, it was decided to carry out two final clearance tests at 90-day intervals. 31,470 head showed 77 reactors on the first test on a very severe scale of judgement of reaction. They were immediately slaughtered after the test and only 16 showed discrete glandular lesions, 11 being from one specified mob. The second test of 31,313 head showed 41 reactors, 10 again being from the previously mentioned mob. Eleven of the 41 reactors showed discrete glandular lesions on slaughter. In view of the high percentage of reactors in the specified mob of 127 head, this herd was completely slaughtered out, but no lesions were found in the remainder.

The policy of annual testing with a slaughter of reactors has been combined with an extensive paddocking development to get cattle on to free range and burning of the old kraals.

The actual reactor percentages over the years were—

	Percentage Reactors			*Percentage Reactors*
1953	20.5	1959		1.13
1954	2.01	1960		0.53
1955	2.07	1961		0.79
1956	0.84	1962		0.18
1957	0.42	1963	90 day interval tests:	
1958	1.19		1st	0.21
			2nd	0.13

Of a total of 92,146 animals tested in 1962/63, a total of 207 reactors gives a national percentage incidence of 0.22.

Meat Inspection Incidence

Cold Storage Commission Abattoirs	*Carcass Condemnation*		*Part Condemnation*	
	Bovine	*Porcine*	*Bovine*	*Porcine*
Salisbury	4	—	18	—
Bulawayo	3	3	20	24
Umtali	—	—	—	—
Fort Victoria	2	4	1	—
	9	7	39	24

Total Slaughterings:

Bovine . . 272,993 = 0.15%

Porcine . . 107,252 = 0.28%

It is obvious that a national eradication scheme of Tuberculosis in domestic stock is fully justified.

Bovine Brucellosis

Veterinary Districts: 277 premises tested.

Positive Premises: Salisbury 15, Bulawayo 13, Gwelo 11, Fort Victoria 7, Sinoia 5, Umtali 2, Gwanda 2, Chipinga 2—Total: 57 = 20.6 per cent.

4,199 samples were tested with 366 positives.

Quarter Evil (Clostridium chauvoei)

Outbreaks were confirmed as follows:

Gwelo	45 outbreaks	84 deaths
Salisbury	30 outbreaks	228 deaths
Bulawayo	14 outbreaks	27 deaths
Fort Victoria	13 outbreaks	117 deaths
Sinoia	9 outbreaks	31 deaths
Gwanda	7 outbreaks	28 deaths
Umtali	7 outbreaks	28 deaths
Chipinga	7 outbreaks	29 deaths
	132	572

Many more outbreaks with deaths occurred of this readily recognisable disease where owners immediately resorted to vaccination without notification of the disease.

The cheap and effective vaccination against this disease seems to be neglected by many ranchers until deaths occur. The same pattern is now emerging in the Tribal Trust Lands.

PROTOZOAL DISEASES

Trypanosomiasis

See report for Tsetse and Trypanosomiasis Control Branch.

Theileriosis (Theileria lawrencei)

Confirmed outbreaks:

Districts	*Centres*	*Deaths*
Salisbury	22	121
Fort Victoria	2	22
Chipinga	1	1
Umtali	1	2
Gwelo	1	1
	27	147

Hitherto the main control factor employed with success was the early control of ticks in the spring on any premises where this disease had previously existed or on any premises to which cattle from a previously diseased centre had been moved.

With the exceptional flush of ticks this year it was found that disease was spreading to adjoining premises by tick conveyance and spread, probably on ground rodents, etc.

Legislation to deal with this change in epidemiology of the disease is being framed.

FUNGAL DISEASES

Streptothricosis

A mild form was prevalent in the north-west areas, being marked in the Gwaai Tribal Trust Lands and in the Lutope Forest Area. It was also reported in Que Que Tribal Trust Lands. Uneventful recovery usually supervened but several affected animals were slaughtered at each centre — mostly mature or aged oxen.

DISEASES DUE TO MITES

Mange

Sarcoptic mange in pigs was reported in Salisbury and Gwelo Districts.

Sheep Scab

One outbreak was successfully controlled in Chipinga District with DDT dipping.

SPECIFIED POULTRY DISEASES

VIRAL DISEASES

Epidemic Tremor

This disease was confined to three breeding flocks in the Salisbury District, being traced back from typical morbidity in day-old chicks delivered to Bulawayo and Rusape purchasers. The incidence seems to have been evanescent as tracing of all other sales failed to reveal any spread elsewhere.

BACTERIAL DISEASES

Fowl Cholera

An early survey of the poultry in the known area of recurring infection kept outbreaks to a minimum.

Five outbreaks were confined to the source flocks with the slaughter of 1,214 birds on a compensation basis.

Fowl Typhoid

Twenty-four outbreaks were diagnosed. Twenty were dealt with on the old testing-out basis with slaughter of reactors. 31,622 birds were tested out as clean, 850 reactors being slaughtered.

Four outbreaks were controlled by the use of 9 R-type vaccine in commercial birds where no breeding for sale occurred.

Bacillary White Diarrhoea

No outbreaks were confirmed. Ninety-one flocks, consisting of 90,899 birds, were submitted to the obligatory annual test with negative results, and certificates of freedom from disease were issued.

NON-SPECIFIED DISEASES

Ephemeral Fever

With the continued summer rains and high incidence of insect vectors a very severe and widespread outbreak of this disease was noted in late December 1962, and persisted in some districts until March 1963. Many loadings of finished beeves had to be cancelled in February 1963, as herds could not be travelled and the outbreak in dairy stock in the Midlands drastically reduced milk production. Mortalities and permanent paralysis of hindquarters were recorded in most areas.

Vibrio Foetus

Tampon samples from 120 properties showed 178 positives out of 2,764 specimens, involving 20 herds.

The disease seems of minor economic significance.

Paratyphoid

Cases were confirmed in Gwelo District only, but it is suspected that this disease is a constant but minor erosive factor in calves in undeveloped areas still using night kraals. A reliable vaccine is also reducing the mortality formerly caused by this disease.

Heartwater

Mortalities were minimal, only being reported in Fort Victoria, Gwanda and Bulawayo districts. Toxophene dipping and successful treatment by antibiotics has given full control of this one-time scourge of the lowveld.

Sweating Sickness

Insignificant incidence of a very mild nature, except in Gwelo and Victoria districts where severe affections were noted in dairy herds.

Malignant Catarrh (Snotsiekte)

Only a few cases were reported in Victoria District.

Tetanus

Despite press articles and propaganda, the use of rubber rings for castration of calves and lambs gave a marked increase in deaths from this infection.

This method of castration, apart from the cruelty angle, is strongly contra-indicated in this country.

Myiasis

A few cases were still noted in the Tribal Trust Lands.

Ophthalmia

A marked occurrence was recorded but mostly in exotic stock, except in Bulawayo District, where it was prevalent generally from January to March 1963.

Enterotoxaemia

Twenty outbreaks with a hundred deaths were notified, but many others occurred without being reported in newly established flocks.

Propaganda as to the necessity for vaccination has led to a marked increase in this cover.

Blue Tongue

Three outbreaks were reported where vaccination had not been effected, two in Sinoia and one in Bulawayo District.

Horse-sickness

Deaths occur sporadically even in multiple-vaccinated horses from 'wild' strains of the virus. Nineteen deaths were reported of vaccinates this year, but considering the terrific vector challenge due to excessive rains, this was not alarming.

Bowel Oedema (Pigs)

Sporadic death-waves in weaners in mid-summer still continue, due to ill-advised dietetic changes, despite extensive propaganda at discussion groups.

Virus Pneumonia in Pigs

This remains confined to the Eastern Districts. Lung lesions in slaughtered pigs from original centres are markedly decreasing in incidence.

Verminosis

Routine submission of faecal samples from herds and flocks has become a regular practice by many ranchers following the Department's sustained propaganda, and most District Officers are running local dosing trials as demonstrations to farmers' associations, etc.

The significance of food supplementation and regular dosing at strategic intervals is now being widely recognized as regular weighing of stock discloses the difference between treated and untreated herds. The necessity of movement to clean pastures after dosing has had to be stressed.

Mortality from heavy infestations of *Haemonchus* sp. and immature forms of *Paramphistone* sp. have been marked in both cattle and sheep this year.

Despite its cost, the use of thibenzole, especially in sheep, is rapidly mounting as the weight increase thereafter is markedly significant.

PROTOZOAL DISEASES

Piroplasmosis (Redwater)

This was confined on 103 properties with 88 known deaths. On most European properties the widespread use of organo-phosphates is definitely limiting the main vector, *Boophilus* sp.

Anaplasmosis (Gallsickness)

This was confirmed on 253 properties with 176 deaths. Organo-phosphate dips being used at ill-advised widespread intervals has led to an increase in multi-host ticks with a resultant upsurge of this infection.

Coccidiosis

With prolonged rains, this disease assumed even more serious significance than last year in bovine and ovine weaner stock, mortalities reaching nearly 200 in both species. Outbreaks in pigs were also recorded and the usual significant levels were noted in poultry and rabbits.

Trichomoniasis

Sporadic incidence was diagnosed on a few ranching properties.

DEFICIENCY CONDITIONS

Aphosphorosis

Many properties in the Midlands, and running to the south-east therefrom, still show this condition and could, with profit, use supplementary licks.

Copper

Rupture of the aorta and pulmonary artery in piglets on a copper-deficient diet was noted in the Gwelo area.

Iodine Deficiency

Calves that were born dead or died within 48 hours, on one ranch, were found consistently to have thyroids only averaging 12/13.7 gm. weight. The feeding of iodized salt corrected the condition.

POISONING

Arsenic

As has been repeatedly stated in these reports previously, the careless handling of arsenical dip by farmers, has been an open invitation to sabotage by anyone so minded and this has been a marked feature of this year. About 900 cattle and 20 sheep died from arsenic, of which approximately 70 per cent. was sheer carelessness, and about 30 per cent. sabotage.

Lead

Nine cattle died mainly from consuming discarded car batteries.

Fertilizers and Seed Dressings

Twenty-nine cattle died after consuming these products where they had been spilled, etc.

Hydrocyanic Acid Poisoning

Fifteen bovines died from this cause, mostly on wilted early grazing.

Sodium Chloride (Salt)

Sixteen pigs died from excessive salt consumption.

Organic Poisoning

Dips

Cattle deaths were reduced to 32 only; few farmers now employ these in strengths approaching toxicity, due to their high price.

Anthelmintics

Thirty-four cattle and 11 sheep were killed by overdosing. Ranchers in general are now paying more attention to exact dosing.

Food Poisoning

Urea

Only 50 deaths were recorded this year. Most farmers now keep these blocks under cover and do not feed them near water troughs.

Diplodia

The incidence was minimal, only eight deaths being recorded.

Plant Poisoning

Deaths from some unknown toxic factor still persisted in the Gwaai area, despite active investigation. Such deaths, however, can be controlled by a system of timed introduction of cattle to the specific areas.

The customary deaths from *Dichapetalum* sp. (M'kauzaane) occurred in the Matabeleland area largely where overstocking occurred.

Senecio sp. in the Eastern Districts poisoned 66 bovines but this could have been avoided by pasture management.

Forty-seven other deaths were attributed to the following species: *lantana, urginea, tribulus, crotalaria, ricinus* and *pteridium*.

One hundred and fifty-six deaths were attributed to plant poisonings, in which no specific diagnosis could be established.

ARTIFICIAL INSEMINATION

Two centres were operated at Bulawayo and Gwelo, by the Field Branch.

	Inseminations 1962-63	*Doses Semen Sold 1962-63*	*Inseminations 1961-62*	*Doses Semen Sold 1961-62*
Gwelo . .	831	341	992	250
Bulawayo .	1,225	505	1,645	437

Conception rates averaged 68.7 per cent. in Bulawayo and 68.2 per cent. in Gwelo.

An average of 21.3 miles travelling per insemination in Bulawayo was recorded compared to 11.8 miles in Gwelo.

Storage costs were halved by the introduction in May 1963 of liquid nitrogen flasks instead of bulk dry-ice storage.

Friesland, Jersey and Charollaise semen was available, all supplied by the Transvaal Artificial Insemination Centre, and was of excellent quality throughout the year.

This scheme is now becoming a charge to Government in that the larger herds are purchasing semen and inseminating their own cows and it is the small owner, of little import to the dairy industry as a whole, who still takes advantage of the subsisidized mileage charge and his has cows inseminated. The continued steady fall in insemination, with rise in mileage at Bulawayo (21.3 miles compared to 16.8 miles per cow in 1961/62), underlines this trend.

GENERAL

The growing importance of district offices as local diagnostic centres is revealed by the following returns:

Smears Examined	*Post-mortems Performed*	*Faecal Samples Examined*	*Other Samples Examined*	*Dip Fluid Assays*
18,528	946	3,654	854	9,527

The ground is thus gradually being prepared for the establishment of local veterinary investigation units in close collaboration with the regulatory services.

MEAT INSPECTION

On his appointment by the Federal Government in 1961 the Senior Meat Hygiene Officer had included in his duties consideration of the system and practice of meat inspection, the worth and effectiveness of the existing slaughtering and meat inspection legislation, suitability of the construction and layout of the premises under the control of the Veterinary Department, slaughter and dressing of the animals in the foregoing premises, and the handling of carcasses from the slaughter floor onwards, particularly in regard to the export of carcasses, boneless cuts and organs. It soon became obvious that the scope of these investigations would have to be extended to include the treatment of animals before slaughter, i.e. during their journey to the various Cold Storage Commission abattoirs and during their detention period in the waiting pens. At these times animals are inevitably subjected to a degree of stress brought about by factors such as excitement, uncertainty, fear, hunger and temperature changes, the effect of these being to deplete the glycogen level in the muscles of the live animal and to interfere with good bleeding of the animal when it is slaughtered. A considerable part of the work during the year has been to impress upon the persons concerned the importance of diminishing those stress factors which militate against desirable tenderness, palatability, good appearance and durability of the flesh of animals. Attention has, therefore, been drawn to the need for greater care in the transport of animals, to the need for an adequate period of rest for the animals awaiting slaughter, during which time they should be both fed and watered, and to the provision of some cover for the animals to protect them from rain and the direct rays of the sun. It is gratifying to report that very considerable progress has been made in respect to the pre-slaughter treatment of animals in all Cold Storage Commission premises.

Attention was also directed to improvement in the races leading from the waiting pens to the stunning box, mainly in reducing the length of the race, and to replace the electrical method of stunning of cattle by the use of the captive bolt pistol. The undesirable delay between stunning and bleeding is another matter which has received attention and the installation of low-level bleeding of cattle is to be introduced as soon as practicable.

The dressing of cattle also received attention and these animals are now skinned on trestles raised from the slaughter floor. The use of wiping cloths has now been forbidden, the carcass sides now being cleansed both inside and out with a high pressure water spray. Improvement was also obtained in the sterilization of offal trays and trays for boneless meat and in the construction of boning-out rooms. Agreement was reached on a programme ensuring uniformity in slaughter and dressing of animals in all the Cold Storage Commission works and in the uniformity of hygienic practices throughout these works.

The position regarding cattle affected with beef measles (*Cysticercus bovis*) shows no improvement. In Salisbury 96,599 bovines were slaughtered during the year and infection found in 1,031 carcasses, an incidence of 1.04 per cent. In 1962, the incidence was 0.91 per cent. In Bulawayo 112,379 bovines were slaughtered and infection found in 2,866 carcasses, an incidence of 2.55 per cent. as compared with an incidence of 2.47 per cent. in 1962.

The technique for the detection of hydatid cysts in the lungs of slaughtered cattle was modified during the year, a deep incision being made from base to apex of each lung. The value of this modification in inspection procedure has been amply demonstrated by the fact that whereas in 1962 in cattle slaughtered in Salisbury 0.2 per cent. of lungs were found infected, in 1963 the incidence was found to be 0.5 per cent.

The shortage of meat inspection staff at the Salisbury and Bulawayo plants continued to be a matter of some concern during the year but alleviation of the problem may be expected about the middle of 1964 when six students undergoing training in meat inspection in Glasgow return to Southern Rhodesia. The routine ante- and post-mortem examination of all animals slaughtered at the Commission plants has proceeded satisfactorily but the regulations which control slaughter and meat inspection in Southern Rhodesia date back to 1945 and now require urgent revision. A sub-committee to deal with this matter has been formed with representatives from the Ministry of Health and the Department of Veterinary Services and nine meetings have already been held.

STOCK SLAUGHTER FIGURES

	Cattle	*Pigs*	*Sheep and Goats*
Salisbury C.S.C.	96,599	76,885	10,976
Bulawayo C.S.C.	112,379	19,611	9,956
Fort Victoria C.S.C.	55,716	8,723	1,034
Umtali C.S.C.	8,299	2,033	2,333
	272,993	107,252	24,299

CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Salisbury	717¾	237	64
Bulawayo	878	317	7
Fort Victoria	581½	105	—
Umtali	82	2	22
	2,259¼	661	93

CARCASSES DETAINED FOR *C. BOVIS*

Salisbury	867
Bulawayo	2,401
Fort Victoria	583
Umtali	25
TOTAL	3,876

MAIN REASONS FOR CONDEMNATION

	Cattle	*Pigs*	*Sheep*
Emaciation and Oedema	644	25	19
Measles	733	496	—
Sarcocysts	216	9	—
Bruising	137	—	—
Pyaemia	46	26	6
Pleurisy and peritonitis	240	5	2
Tuberculosis	9	7	—

TUBERCULOSIS

Incidence in Slaughtered Stock

Nine bovine carcasses were condemned for tuberculosis in a total kill of 272,993 head of cattle and seven porcine carcasses were condemned in a total kill of 107,252 pigs slaughtered under veterinary supervision at Government controlled abattoirs.

RECORD OF FRACTURES OCCURRING IN THE DORSAL VERTEBRAE OR PELVIS OF CATTLE SLAUGHTERED AT THE COLD STORAGE COMMISSION PLANT IN SALISBURY

1962		*1963*	
June	104	January	45
July	66	February	52
August	117	March	76
September	120	April	82
October	92	May	41
November	94	June	45
December	29	July	41
		August	61
		September	15
		October	9

Note: In the latter part of 1962 the high incidence of fractures in young animals made it necessary to lower the time of application and the electrical current from 30 seconds to 15 seconds. In September, 1963, the use of the electrical apparatus was discontinued and replaced by the captive bolt pistol.

CATTLE CENSUS AND DIPPING TANKS

	European	*Native*	Total	*Dip Tanks*	*Spray Races*	*Hand*
Bulawayo . .	353,665	453,040	806,705	1,178	69	184
Salisbury . .	387,679	361,968	749,647	1,462	490	342
Gwelo . .	284,939	293,929	578,868	994	69	52
Fort Victoria .	232,731	497,895	730,626	737	92	—
Gwanda . .	125,769	290,524	416,293	386	15	—
Umtali . .	71,683	172,134	243,817	453	160	—
Chipinga . .	53,993	60,044	114,037	227	17	13
Sinoia . . .	122,593	73,310	195,903	354	120	117
	1,633,052	2,202,844	3,835,896	5,791	1,032	708

IMPORTATIONS

	Republic of South Africa	*Northern Rhodesia*	*United Kingdom*	*Bechuanaland*	*Holland*
Bulls . .	126	5	12	307	4
Cows . .	85	33	—	3,358	14
Heifers . .	63	—	—	—	—
Oxen . .	6	—	—	9,759	—
Calves . .	21	—	—	8	—
Mares . .	73	—	—	—	—
Stallions .	46	—	2	—	—
Geldings .	231	1	—	1	—
Mules . .	26	—	—	—	—
Pigs . .	9	—	—	—	—
Sheep . .	781	—	—	4,747	—
Goats . .	—	—	—	251	—

Bovine, 13,801; Equine, 380; Porcine, 9; Ovine, 5,528; Caprine, 251.

EXPORTATIONS

	Republic of South Africa	*Northern Rhodesia*	*Moçambique*	*Bechuanaland*	*Nyasaland*	*Kenya*
Bulls . .	3	403	20	6	—	—
Cows . .	1	484	137	—	—	—
Heifers . .	175	401	188	—	—	—
Calves . .	1	7	5	—	—	—
Oxen . .	—	1,421	5	—	—	—
Mares . .	13	1	—	—	—	—
Stallions . .	12	1	3	—	—	—
Geldings . .	39	30	3	—	—	1
Mules . .	—	1	—	—	—	—
Donkeys . .	—	18	—	—	—	—
Pigs . .	1	21	—	—	12	—
Sheep . .	—	37	—	—	—	—

Bovine, 3,257; Equine, 122; Porcine, 34; Ovine, 37; Caprine, Nil.

VETERINARY RESEARCH BRANCH

STAFF

Although the year commenced with a relatively depleted professional staff the situation improved considerably by the beginning of 1963 when three of the vacant Professional Officer posts, namely the Pathologist post, the game Zoologist post and the Poultry Pathologist post were all filled. No appointment was made during the year to the Chief Veterinary Research Officer post or the Pig Specialist post.

Dr. J. R. Philip returned from Davis University, California, to take over the Poultry Pathologist post and Dr. H. H. Roth transferred from Tsetse and Trypanosomiasis Control Branch to fill the Game Zoologist position, while the position of Pathologist was taken up by Mr. J. A. Lawrence of the Field Staff.

These appointments enabled the Branch to complete the year with a staff of six professional officers.

A scholarship was received from FAO for the Pathologist, Mr. Lawrence, to undertake six months' advanced study commencing in mid-September in the United Kingdom.

One member of the staff — a Laboratory Technician Grade III — resigned but his post was filled by an experienced replacement who had previously worked with the Branch in 1958.

The trend today is to employ female technical staff in the entrance grades as they appear to settle down more happily than their male counterparts. The turnover in personnel during the last six years has been very considerable indeed. It may be that this is due primarily to the lack of promotion prospects and the insecurity resulting from the present unfortunate situation in which youngsters have difficulty in achieving a recognizable diploma or associateship in technology

Dr. John McLeod joined the laboratory in April 1963, on a three-year assignment from FAO, to make an intensive study of the tick problem with a view to promoting better control.

ROUTINE SERVICES

Each year the demand for such services increases and each year sees the addition of more techniques which enlarge and improve the services provided.

In addition to scheduled disease specimens from the Field Staff, a large variety of specimens are received from veterinary practitioners and from farmers. We also provided, in the limited field of vibrio foetus, diagnostic services for Northern Rhodesia and Nyasaland.

DIAGNOSTIC SERVICES

During the year a total of 9,729 specimens for diagnosis were received and dealt with. These are classified as follows:

Blood smears	133
Bacteriological examinations	443
Foetal specimens	82
Blood samples	4,413
Tampons	1,808
Milk samples	366
Rabies specimens	87
Poison examinations	421
Specimen for tuberculosis examination	13
Faeces samples	303
Poisonous plant specimens	24
Enterotoxaemia specimens	17
Histological specimens	49
External parasites	2
Rift Valley fever specimens	17
Miscellaneous	209
Post-mortem examinations—	
Poultry	1,216
Cattle, sheep, pigs	71
Small animals (including chinchillas)	55

From the above material the following diagnoses were made:

Brucella abortus—	
(a) blood samples positive	445
(b) tampons positive	218
Tuberculosis positive	1
Rabies positive	17
Mastitis positive	106
Poisoning—	
Arsenic positive	120
Lead positive	2
Cyanide positive	1
African swine fever	2

POISONING

The ever-increasing variety of chemical compounds being used in the farming world today brings greatly enhanced possibilities of poisoning of stock. Although in a number of cases only one or two animals may be involved and a definite diagnosis may not be made, the circumstances and the symptomatology clearly indicate the possibilities.

Dips

Although arsenic is still the greatest danger to stock among dips in use, the chlorinated hydrocarbons and the organo-phosphate ranges now in relatively wide use in this country have widened the possibilities; especially is this so where the potentialities and idiosyncrasies of these compounds are not fully recognized by the users. Apart from cases of deliberate poisoning, most of the cases have occurred due to careless use of the products.

Plant Poisoning

Increasing attention during the past few years, and especially the work of Dr. Shone, previously of this Branch, and Mr. Drummond of the Branch of Plant Pathology has stimulated the interest of the farmer, producing an awareness of the problem which was previously accepted as a recognized risk. Investigations into the problem are still being carried out by the pathologist wherever cases are reported and suspect material is made available.

Feedstuffs

Although certain feedstuffs have always been a recognized risk with various classes of stock, the list of dangerous feeds appears to continue to grow. The introduction of urea as a feed supplement during the dry season has produced casualties, firstly from careless administration, rain contamination, etc., and latterly by admixture with such urease containing feeds as jack bean and soya bean.

Diplodia in maize, long recognized by the stock farmer, gave inconsistent results when experimentally fed to stock. However, investigation showed that less than one-fifth of cobs discarded by the farmer were actually affected by true diplodia — the remainder being presumably non-toxic moulds, etc. This fact undoubtedly explains the inconsistent results previously obtained when feeding with affected maize selected by farmers.

AFRICAN SWINE FEVER

An outbreak of this condition occurred in the south-west of the country towards the latter end of the year under review. The diagnosis was confirmed by biological tests at the laboratory and on material forwarded to Muguga in Kenya. Considerable experience has now been gained in the diagnosis of this condition using the haemadsorption test with buffy-coat cultures, so that a diagnosis in future should be obtained rapidly at this laboratory without having to send material outside the country.

POST-MORTEMS

The record number of 28 chinchilla post-mortems during the year is an index of the rapidly increasing growth of the chinchilla industry in the country.

The most common cause of loss, appears to be a bacterial enteritis.

MASTITIS

Out of 365 such samples submitted, 113 were recorded as being positive for mastitis with the following classification: Streptococcal 24, staphylococcal 44, pseudomonas pyocyanea 18, *E. coli* 7, high-cell count; no bacteria 20.

All milk samples for mastitis examination are smeared for leucocyte count and cultured on receipt and the remainder of the sample incubated and recultured the following day should the original culture not prove positive.

The organisms responsible for the positive cases are checked for sensitivity against at least nine antibiotics. The latter procedure has been adopted in view of the widespread owner-misuse of antibiotics which are freely obtainable at all chemists so that sporadic cases of mastitis are usually owner-treated, the veterinarian only being called in if a widespread condition ensues in the herd. At least 16 of the 44 staphylococcal strains isolated were penicillin resistant.

POULTRY DISEASES

Poultry diagnosis

A free service is offered to the public in the diagnosis of poultry disease. It is also frequently necessary to undertake investigations in the field and the figures given below for laboratory examinations do not reflect the actual losses resulting from the diseases given:

Diagnosis	*Number of Cases*
Fowl typhoid	41
Fowl cholera	12
Avian encephalomyelitis	21
Fowl pox	2
Avian mycoplasmosis (C.R.D.)	41
Infectious sinusitis (turkeys)	3
Infectious bronchitis	19
Infectious coryza (haemophilus infection)	18

Leucosis (all forms)	130
Fowl paralysis (Marek's disease)	32
Neoplasms	41
Histomoniasis (chickens)	56
Coccidiosis (all forms)	142
Trichomonas infection (turkeys)	8
Non-specific bacterial infections	184
Egg peritonitis	39
Non-specific enteritis (turkeys)	18
Visceral gout and nephrosis	9
Avian monocytosis (pullet disease)	3
Nutritional encephalomalacia	63
Avitaminosis A	11
Internal and ectoparasites	11
Faulty management or environment	108
Poisoning	21
Injury	4
Miscellaneous conditions (including injuries, cannibalism, negative reports	183
TOTAL	1,216

It will be appreciated that analysis of the actual economic losses resulting from non-scheduled diseases of poultry, based on laboratory post-mortem figures is frequently entirely misleading. Such figures give no indication of actual losses involved in an outbreak, resulting either from mortality or, as is frequently more important, loss of production or failure to gain weight. Furthermore, the vast majority of specimens received by the laboratory come from small backyard flocks rather than from breeders and producers who are in the business for a livelihood. This may, in part, be due to the undoubted ability of many breeders to diagnose and treat most common diseases without professional veterinary assistance. It may also be due to the reluctance of some farmers to have the existence of disease on their premises made known, for quite obvious reasons and, of course, in Rhodesia it is often difficult and expensive to send birds long distances to the laboratory, or to the nearest District Veterinary office.

In recent months a concerted effort has been made to increase both the scope and efficiency of the diagnostic service in order to gain a broader view of the actual disease position in the country. A properly equipped poultry diagnostic laboratory was set up at the Bulawayo District Veterinary office with an experienced Poultry Pathologist in charge. Owners of the larger breeding and commercial flocks as well as trade representatives of feed and pharmaceutical firms dealing with poultry are being asked to make fuller use of the diagnostic services available. A specially printed "Submission" form has been introduced. All persons submitting birds for diagnosis are required to give details as to the size of the flock, type of operation, medication used, number of birds ill or dead and, in the case of chicks or poults, the name of the breeder. The reverse side of the sheet is used to record details of all laboratory tests performed, autopsy details, etc. In this way it will be possible to build up a comprehensive history of most flocks from which specimens are periodically received.

Chronic Respiratory Disease

Although not reflected in the post-mortem figures above, chronic respiratory disease (PPLO infection), either alone or in combination with infectious bronchitis, haemophilus coryza or *B. coli* is a cause of greater economic loss than any other single disease entity of poultry in Southern Rhodesia. In broiler establishments, the disease may or may not be accompanied by mortality but is always the cause of poor feed-conversion ratios, heavy culling and increased costs of production. This disease is, in fact, the major limiting factor to successful broiler production in Rhodesia. Two important factors that make PPLO infection difficult to control are:

(1) The almost universal spread of mycoplasmosis amongst breeder flocks supplying broiler chicks to the trade, and

(2) the continuous production system of broiler growing with no break between the batches as in the 'all-in-all-out' system.

An energetic approach will have to be made to combat this disease in the next few years if the broiler industry is to continue at its present rate of expansion. Infection must either be eradicated at its source, the breeding and supply flocks, or the broiler industry must revolutionize its production and management systems in such a way that the disease can at no time gain the upper hand.

Fowl Typhoid

This continues to be a smouldering problem although the figures for the year appear to indicate a definite increase in incidence over the past few years. The disease is mainly a problem in African-owned flocks and a few European-owned flocks where there is close contact with native fowls in adjoining compounds or reserves. While the system of total eradication of infection by repeated blood-testing and improved hygiene has been highly successful on European-owned establishments, it is obvious that a different approach will be necessary to deal effectively with the disease in African areas. In recent years Africans have been purchasing increasing numbers of genetically superior exotic stock from European breeders. Unfortunately, their background renders them far more susceptible to such diseases as fowl typhoid and cholera than the more hardy indigenous breeds with which they come in contact. This potentially explosive position can and should be largely overcome (in the case of typhoid) by widespread vaccination with the 9 R strain of *S. Gallinarum* vaccine. At present this vaccine is manufactured by a commercial pharmaceutical firm in the United Kingdom and distributed under licence in this country at a price of 40s. per 100 doses, hardly an economic proposition for the average African farmer. It is understood, however, that a similar product will shortly be available from Onderstepoort at a much-reduced price. Every effort must be made to encourage African poultry owners to make use of both this and the fowl pox vaccine.

Infectious Bronchitis

Although suspected as being present in Southern Rhodesia for some time, virus isolation and serological tests confirmed the presence of this disease for the first time. The implications of bronchitis in breeder flocks will obviously be governed by the actual incidence, the full total of which will not be known until the completion of the survey now under way.

PREVENTION AND CURATIVE SERVICES

VACCINES

	1962-63	*1961-62*	*1960-61*
Anthrax vaccine	33,500	48,160	174,078
Bluetongue vaccine	14,900	9,850	20,000
Calf paratyphoid vaccine	9,160	7,795	7,281
Calf paratyphoid vaccine for use in adults	506	272	473
Contagious abortion vaccine	117,941	97,932	86,427
Brucella Rev I vaccine	660		
Enterotoxaemia vaccine	35,700	19,400	5,650
Fowl pox vaccine	404,900	431,100	485,180
Gallsickness vaccine	17,655	22,670	18,885
Redwater/Gallsickness vaccine	7,922	9,248	8,133
Horse-sickness vaccine	5,713	6,062	5,370
Lumpy-skin vaccine	1,829	145	175
Quarter-evil vaccine	458,450	483,980	475,330
Quarter-evil malignant oedema vaccine	67,560	89,020	55,380
Rift Valley fever vaccine	150	Nil	550
Lamsiekte vaccine	1,480		

The figures supplied of such vaccines as contagious abortion S19, quarter evil, enterotoxaemia do not necessarily represent the total figures of those vaccines used in the country because all the above-named vaccines are also available from various commercial firms.

The considerable increase in the use of contagious abortion S19 vaccine approximately 20,000 doses more than the previous year, is gratifying and reflects the importance with which the farmer and rancher regards the control of this disease.

The figure for use of anthrax vaccine continues to drop reflecting the satisfactory position of control of this condition of this country.

The most noticeable increase in the use of enterotoxaemia vaccine during the last three years can be almost wholly attributable to the increased farmer-awareness of the necessity for vaccinations. It is also interesting to record the introduction of Brucella Rev I — 660 doses used — to the sheep breeder. It is obvious that sheep breeders are keenly aware of the necessity to control losses and increase the productivity of their flocks. The introduction of this Rev I vaccine was unfortunately marred by the loss of four young rams in a flock shortly after vaccination, a result which the owner attributed to the use of the vaccine, but which the

Branch considered was probably due to enterotoxaemia, a diagnosis it was, unfortunately, not possible to confirm.

Whereas previously the use of gallsickness vaccine was confined almost wholly to April and May to correspond with weaning time on the ranch, alterations in the times of calving now mean that a considerable quantity of the vaccine is required in October and November.

QUARANTINE OF IMPORTED ANIMALS

Bovines	*Country of Origin*		
Breed	*United Kingdom*	*Republic of S.A.*	*Holland*
Friesland	2 bulls	3 bulls	15 cows 2 bulls
Jersey		1 bull	
Aberdeen-Angus	5 bulls	2 bulls	
Shorthorn	1 bull	1 bull	
Hereford	3 bulls 2 cows		
Brahman		2 bulls	
Other Importations			
Ex Belgium		2 Pietrain boars	
Ex Belgium		1 Landrace boar. 2 Landrace gilts.	
Ex Sweden		1 Landrace gilt	
Ex Nyasaland		9 native sheep	

In addition to the above animals four Rhodesian-bred bulls, two Jersey, one Aberdeen-Angus and one Hereford passed through the quarantine stables.

Thirty-four of the above bovines were vaccinated against redwater and gallsickness while in the stables and thirty-five were tested for tuberculosis.

ARTIFICIAL INSEMINATION

There was no appreciable increase in use of the services but the fact that there was no considerable decrease speaks for the fact that conception rates have been maintained at a satisfactory level, as is substantiated by the conception rate figures.

Efforts to increase use of the service during the year failed completely. Four farmers' meetings specifically concerning artificial insemination were arranged in areas where some interest was being shown. The response at these meetings was exceedingly poor and no further extension of the service resulted from the meetings. A general meeting of Salisbury and District Intensive Conservation Area groups was also addressed with a similar result.

Experiments continued with quick-freezing of semen in liquid nitrogen with very satisfactory results and the method was made available to the Artificial Insemination project of the Ministry of Agriculture, Southern Rhodesia.

Excellent service and excellent quality semen continued to be received from the Transvaal Artificial Insemination Co-operative. Dr. A. B. la Grange, Veterinary Director of the Co-op., paid a three-day visit during the year. This was very stimulating and mutually beneficial. He met the Artificial Insemination Committee and discussed artificial insemination in this country and in the Republic and the common problem of extension, at length. It was interesting to hear that artificial insemination extension has also ceased in the Republic and also that approximately the same proportion of the dairy cattle are being bred artificially in the Republic as obtains here, approximately 4 per cent., a very insignificant figure.

There was a gratifying increase in the use of Charollais semen on poorer types of Friesland animals in the past year and a Jersey breeder and Henderson Research Station have started using it in this manner, with Jersey cows.

Trichomoniasis

During the year this condition was diagnosed in ranch cattle on three properties, including Matopos Research Station, giving a total of five infected properties to date. Experiments with diagnosis on one large ranch employing a resident veterinary surgeon, have shown that the most reliable method of diagnosis is by direct microscopical examination of sheath lavage specimens. In this way it is possible to eliminate infected bulls. At present there is no satisfactory treatment for the condition, which undoubtedly causes infertility and early abortions.

A recent Italian report (Gasparini, Vaghi and Tardani (1963), *Vet. Rec.*, 75 - 940) holds great promise for a new drug, metronidazole (8823RP), in the treatment of trichomoniasis. The treatment of bulls thus becomes a distinct possibility, when the drug becomes available commercially at an economic price.

Experiments with the use of phenothiazine as an aid to diagnosis by microscopical examination are being carried out on this affected ranch. Gabel *et al.* (1963) JAVMA, 128 - 119 and Krill (1944) *Vet. Med.*, 39 - 345, have reported very favourably on the use of this drug. The effect of administration of the drug (by mouth) results in a marked increase of trichomonads in sheath lavages with consequent improvement in diagnosis.

The isolation of an unusual Brucella *organism from ranch cattle*

In pursuance of a line of investigation referred to in the previous Annual Report (page 198) a very unusual *Brucella* sp. was isolated from two ranch herds which have long been affected with specific epididymitis of bulls.

This was an exciting discovery and, of course, raised the question of the possible role of the organism in the etiology of epididymitis of bulls.

The organism was typed as an atypical strain of ***Brucella abortus*** — differing in one respect from all other known atypical strains — by **WHO Brucellosis** Reference Centre, Central Veterinary Laboratory, Weybridge, England.

The pathogenicity of the organism in cattle, sheep, guinea pigs and white rats was investigated as fully as circumstances allowed and it would seem that pathogenically the organism does not differ from typical ***Brucella abortus.***

In limited experimental infection trials the organism has not produced lesions of epididymitis in bulls.

Dr. W. J. B. Morgan, WHO Reference Centre is extremely interested in this isolation. It seems likely that it is the same organism reported briefly by Bevan, L. E. W. (1930) *Brit. Med. J.*, 2 - 267, in this country and sometimes referred to as 'Rhodesian *Brucella abortus*' in the literature. There is no indication in the literature of the source from which Bevan isolated the organism. Although the recent isolates are similar regarding characteristics described by Bevan there is no way of being certain that the strains would be identical on the basis of modern taxonomy.

The present isolates were made from the genitalia of bulls affected with epididymitis.

CONCEPTION RATES

Totals of all centres per quarter	*Conception Rates*			*Repeats*			
	C/R %	*1st Insemination*	*Non-Returns*	*1st Insemination*	*Returns*	*Totals*	*Returns* %
July to Sept. 1962 .	70.4	575	405	575	440	1,015	43.3
Oct. to Dec. 1962 .	66.9	495	331	495	306	801	38.2
Jan. to March 1963	60.6	464	281	464	323	787	41
April to June 1963	63.4	516	327	516	357	873	40.9
Annual Totals							
Salisbury . . .	62.5	1,021	638	1,021	751	1,772	42.3
Bulawayo . . .	68.8	631	434	631	399	1,030	38.7
Gwelo	68.3	398	272	398	276	674	40.9
All Centres . .	65.6	2,050	1,344	2,050	1,426	3,476	41

ANNUAL ARTIFICIAL INSEMINATION REPORT

October 1962 — September 1963

Doses of Semen Used	*1962-63*	*1961-62*	*1960-61*
Salisbury Inseminators . . .	2,257	2,548	2,226
Bulawayo Inseminators . . .	1,225	1,690	2,301
Gwelo Inseminators . . .	830	992	807
Salisbury—Sold to farmers . .	1,796	1,376	1,573
Bulawayo—Sold to farmers . .	505	436	209
Gwelo—Sold to farmers . . .	302	251	140
Salisbury—Veterinary Department animals	123	105	71
TOTAL	7,038	7,398	7,327
Details of Semen Used			
Doses Friesland semen . . .	4,798	5,923	6,152
Doses Jersey semen . . .	1,362	1,300	1,074
Doses Guernsey semen . . .	347	85	19
Doses Charollais semen . . .	521	46	21
Doses Ayrshire semen . . .	10	15	61
TOTAL	7,038	7,369	7,327

Mileage Covered by Inseminators

Salisbury	48,306	48,376	46,595
Bulawayo	26,194	32,971	37,115
Gwelo	9,782	11,707	8,045
TOTAL	84,282	93,054	91,755

Revenue

	1962-1963			*1961-1962*			*1960-1961*		
	£	s.	d.	£	s.	d.	£	s.	d.
Salisbury	3,890	1	5	4,179	19	2	3,811	12	2
Bulawayo	1,969	5	0	2,498	12	6	3,189	12	6
Gwelo	1,337	19	6	1,519	17	6	1,160	0	6
TOTAL	7,170	5	11	8,198	9	2	8,161	5	2

RESEARCH AND INVESTIGATION

LOW FERTILITY IN RANCH CATTLE

Early Weaning Trials

The work being undertaken at Mrewa Cattle-breeding Station in conjunction with the Southern Rhodesia Ministry of Agriculture had, unfortunately, to be suspended owing to the closing down of the station.

Basically the work undertaken shows that—

1. the overriding factor operating against the full expression of latent fertility in Mashona cattle was the presence of a calf at foot;
2. the most consistent method of overcoming this factor was by early weaning the calf at ± 90 days;
3. feeding the cow during the dry season did not improve the fertility rate obtained by early weaning;
4. a comparison of early weaned groups, fed and non-fed, during the dry season, produced an equal level of fertility but the fed group as a general rule came into heat a few days before the non-fed groups;
5. a very high level of first service conceptions was recorded in the early weaned cows;
6. considerable work is required on the husbandry and nutrition of the early weaned calf before this method of improving the calving rate can be fully utilized.

Arsenic

Considerable work was undertaken throughout the year investigating the possibility of arsenical contamination being responsible for persistent poor results in stock rearing in an area of the Umtali North Intensive Conservation Area.

This work was undertaken in association with the Field Branch, the Chemistry Division and the staff of the Department of Conservation and Extension, three farms being selected from which all deaths were checked by Field Staff and samples for analysis forwarded to the Chemistry Division. Soil samples were analysed and hay and rock samples fed to cattle.

It was not possible to incriminate arsenic as being the cause of poor results obtaining on these farms.

Contagious Abortion

While the continued and increasing use of S19 vaccine over the past decade has produced a state of relative control over this condition it is now considered that an assessment of the true contagious abortion position should be made.

Although advice given in connexion with this vaccine has always stressed the basic use in young stock only, the fact that it is often administered by the farmer himself and that it can be used for the protection of adult stocks, has without doubt led to its use in such animals. A preliminary to an eradication campaign, therefore, was undertaken by an initial check, using the milk-ring test, on every churn of milk submitted to the Dairy Marketing Board premises in Salisbury over a complete day. This survey showed that 13 per cent. of the suppliers had *Brucella agglutinins* in their milk. The next step in the survey, investigation of the positive farms, is due to take place as soon as the small animal population is large enough to cope with the expected biological tests.

POULTRY DISEASE SURVEY

In order to obtain first-hand knowledge of the incidence of certain infectious diseases of poultry in Southern Rhodesia, a survey, largely based on specific serological tests, is at present being conducted by the Research Branch in close co-operation with the Field Staff. This type of field survey was considered an essential first step in the planning of disease eradication and control, future research work, and as an aid to obtaining closer co-operation between the Department and the industry as a whole.

To begin with, it was decided to examine the present position in breeding and supply flocks with regard to Newcastle disease, infectious bronchitis, mycoplasmosis (PPLO infection) and avian encephalomyelitis for all of which specific immunological tests are available. Approximately 40 flocks comprising the bulk of all breeding birds in the country are being examined, but the final results are not yet available.

The majority of breeding flocks in this country are small self-contained units rarely exceeding 3,000 adult layers, with only two or three exceeding 10,000. A few breeders operate on franchise agreements with improved genetic strains from well-known British and American breeders. Management and hygiene are of a relatively high standard despite the drawback of inefficient labour. Most farms are well isolated from neighbouring poultry establishments and there appears to be an increasing awareness of the need to take precautions against the introduction of disease via visitors, compound fowls, feed-sacks, chick-boxes, etc. There has been no evidence of the existence of pullorum disease (BWD) amongst breeding flocks for many years and fowl typhoid has only been a problem in the occasional flock where African employees have been permitted to keep compound fowls. Fowlpox vaccine is used routinely and the disease is not a problem.

Nutritional Encephalomalacia

An unusually high incidence of crazy chick disease was recorded during the year. In most cases mortality seldom exceeded three to five per cent. and it is probable that, in many cases, the condition was only brought to attention because of its rather close similarity, clinically, to epidemic tremor. However, the two diseases are easily differentiated on the basis of histopathological examination.

A feed trial involving 500 chicks was set up to determine whether—

(a) conditions of overcrowding and poor ventilation would induce a high incidence;

(b) increased levels of thiamine in the standard broiler ration would reduce the incidence, or indeed affect growth rates in any way; and

(c) whether the incorporation of a synthetic antioxidant (butylated hydroxy toluene) would prevent the condition from developing.

However, the trial was a failure in that none of the groups, including the controls which were fed an identical ration to that which had been incriminated in field outbreaks, developed encephalomalacia. In addition, there was no significant difference in weight gain between the various groups at the conclusion of the trial (six weeks).

Limited experience with field outbreaks indicated that a 0.05 per cent. solution of methylene blue in the drinking water not only prevented encephalomalacia from developing but effected a dramatic cure in clinical cases provided they were actually dosed with the solution before permanent brain damage had occurred. In the Branch's opinion, the disease is probably associated with excessive quantities of polyunsaturated fatty acids in certain batches of fishmeal or carcass meal. Since the incorporation of an antioxidant (santoquin or BHT) into broiler rations by most feed companies, only isolated cases have been recorded.

FASCIOLIASIS

In order to obtain information about the epidemiology of acute fascioliasis in sheep, records of acute outbreaks throughout the year were collected. Nine out of 14 occurred in August and September, two in February and one each in June, October and December. Heavy mortalities occurred in these outbreaks, up to 30 per cent. of flocks dying. This acute character of the outbreaks appears to be characteristic of *F. gigantica* in the sheep flocks, so much so that routine dosing of sheep against liver-fluke is not actually advised.

Records were collected throughout the year on the growth rate of *F. gigantica* in sheep. These suggested that the rate of growth is slow, the parasites taking at least five months to reach maturity; but the character of this infestation is such that the vast majority of deaths occur in sheep when the flukes are between two and three months old.

SHEEP PARASITES

In collaboration with Grasslands Research Station, observations on the infestation of sheep by nematodes in the high-rainfall region of Southern Rhodesia, was continued.

A trial with five Blackhead Persian lambs and five indigenous Nyassa lambs each given 5,000 infective larvae of *Haemonchus contortus,* revealed that the indigenous groups were very much more resistant to infestation than the Persians. Results were judged on blood examinations and faecal worm egg counts. It is known that there are strains within breeds of sheep which are resistant to internal parasites, and therefore the result of the above-mentioned trial is of doubtful significance as the groups used were too small.

Larval cultures from the faeces of various species of antelope in one of the national parks were given to eight worm-free lambs. One lamb only died after receiving 2 x 15,000 larvae of a *Haemonchus* spp. from wildebeeste; 6,045 adult worms were recovered on post-mortem examination. Another worm-free lamb had a faecal worm egg count of 3,200 e.p.g. following a dose of 9,000 larvae from an eland. No further reactions were recorded.

A single dose of thiabendezole was noted to depress, but not eliminate the post-parturient rise in faecal worm egg counts in ten ewes.

SERUM TRANSFERRIN STUDIES IN BOVINES

Under a grant from the Agricultural Research Council studies were commenced in January on the Transferrin (Beta-globulin) types of indigenous cattle. The early part of the year was spent developing the basic techniques of starch gel electrophoresia, by which the Transferrin type was determined.

By the end of September, six Mashona, one Manguni (Mashona), four Tuli and four Africander herds had been studied, a total of 1,500 head being involved.

The use of radioactive Fe 59 in confirming certain doubtful types by the use of autoradiographs greatly assisted the work.

It is interesting to note that although the existence of the homozygous BB type had been postulated due to the finding of all the heterozygous combinations, no one has yet recorded finding this type. In the Branch's studies to date ten cattle of the homozygous BB type among indigenous cattle have been found.

There is a very high frequency of the E and F alleles in Tuli cattle. The B alleles appear to be fairly common in Mashona cattle. Attempts are being made to correlate Transferrin types with fertility and disease resistance, these being factors which affect the economy of the country's cattle production.

All bovines undergoing quarantine after importation from countries outside Africa are being typed as a matter of routine.

DISEASE RESISTANCE IN RHODESIAN-BRED CATTLE

Five Friesland and five Mashona calves were removed from their dams immediately after birth and fed a pooled colostrum, refrigerator stored.

At five months of age they were infected with *B. bigemina* and *Anaplasma centrale* and the blood picture carefully investigated to record any significant difference in the reaction between the two breeds; the results were inconclusive.

GAME/CATTLE DISEASE COMPLEX

Advantage was taken of such projects as Operation Noah and Operation Nagupande to collect a vast number of samples for examination; the former consisted of movement of live animals from islands created by the formation of Lake Kariba while the latter meant discriminative shooting in an effort to stem the advance of tsetse in the area.

In the case of Operation Noah material was limited to blood smears, blood samples and serum samples, enabling direct examination for trypanosomes, to undertake biological tests for trypanosomes and test for the presence of antibodies to various bacterial and viral diseases such as contagious abortion, Rift Valley fever, wesselsbron, foot-and-mouth disease, bluetongue, horsesickness and arborviruses.

Under Operation Nagupande, however, the scope of sampling was very much wider, including as well as serum and blood samples, external and internal parasites, tapeworm cysts, gall-bladders for salmonellosis cultures, etc.

In addition, further material was collected from various ranches where selective game culling is operating.

The collection, examination and distribution of the above material was undertaken by the Game Zoologist, and while it is anticipated that some time will elapse before complete results are available, the following details are submitted.

Viral Diseases

The limited returns from Onderstepoort Laboratories indicate that impala and possibly duiker may be carriers of the blue-tongue virus without having had contact with domestic stock; that rhino seem to develop antibodies against horse-sickness virus, and that this virus occurs in areas where no horses have ever been.

Brucellosis

176 tests have established that wild ruminants and pigs in unsettled areas do not seem to develop specific antibody titres against *Brucella abortus*. This finding contrasts with results from East Africa where wild ruminants have been found to have specific titres in cattle-ranching areas. It may be concluded that *Brucella abortus* is probably transmitted to game species in which it is not original.

Salmonellosis

250 wild ruminants and pigs, both from game country and from cattle-ranching areas have been shown to be free of salmonellae. It is concluded that in respect of meat poisoning, venison is not a potential danger to humans.

Trypanosomiasis

The study of trypanosomiasis has led to the isolation of 21 live game trypanosome strains which may now be used for thorough morphological and immunological investigations. For *T. brucei/rhodesiense* a very high overall incidence (8 to 10 per cent.) could be established, indicating that this parasite is far more abundantly present than the cattle smearing records would suggest. The incidence of *T. congolense* and vivax do not represent a true or significant figure due to technical insufficiencies. No significant difference between tsetse and trypanosome host preferences were found, but a definite dependancy of trypanosomiasis in game on specific ecological conditions has been established.

Helminthiasis

It was established that wild ruminants under sound ecological conditions, although being almost always infected, have very small worm burdens and do not play a significant role in the build-up of helminthiasis in introduced sheep. This confirms Manning's work on the transmissibility of antelope helminths to cattle.

Other Basic Work

Normal blood and serum values have been established for several game species (mainly wild pig, eland, kudu, buffalo, duiker) for any further pathological or serological work.

OSTEOARTHRITIS IN PIGS

During the past few years many complaints have been received of leg weakness in breeding pigs but examinations up to date have revealed no definite source or indeed lesions.

However, during the year an investigation of three landrace sows from one premises, which included a boiling-out of the bony skeleton, revealed a very considerable degree of osteo arthritis of the spine with exostosis and even ankylosis of several vertebrae.

An attempt was made to conduct a survey on all adult breeding stock submitted for slaughter in Salisbury, with a view to investigating farms which proved to be the origin of positive cases.

Unfortunately, pressure of work and shortage of staff forced the Branch to shelve the project until more convenient times.

F.A.O. Tick Survey Project

Considerable ground work has been undertaken by Dr. McLeod, an FAO expert, and a basic plan has been put forward. His preliminary appreciation of the problem indicates that he considers a survey of tick life in Southern Rhodesia as an essential part of the exercise. Such a survey, which is planned on a country-wide scale, would include the effect of such physical factors as soil, vegetation, climate, etc., and the biotic effects such as availability of types of hosts, both wild and domestic, and the influence of man-made factors such as farming patterns, conservation practices, etc., on the distribution of the various species of hosts.

PUBLICATIONS BY MEMBERS OF THE STAFF

Condy, J. B. (1962).—'Fasioliases of domestic ruminants in Southern Rhodesia'. *Rhod. Agric. J.*, 59, 259.

—— (1962).—'Internal parasitism of game animals in Wankie National Park'. *S.A. J. Sci.*, 59, 415.

—— (1963).—'The treatment of eight square-lipped rhinoceros (*Ceratotherium simum*) with an anthelmintic'. *J.S.A. Vet. Med. Ass.*, 34, 99.

—— (1963).—'The capture of black rhinoceros (*Diceros bicornis*), and buffalo (*Syncerous capper*) on Lake Kariba'. *Rhod. Agri. Res.* (in press).

Davison, E. and Condy, J. B. (1963).—'The importation of eight square-lipped rhinoceros (*Ceratotherium simum*) into Southern Rhodesia'. N.R.B. publication.

Rose, C. J., Christie, G. J., and Conradie, A. P. (1963).—'The effect of early weaning on the reproductive efficiency of ranch cattle in Southern Rhodesia'.

Roberts, R. M. (1962).—'Advantages of artificial insemination in dairy herds'. *Rhod. Farm.*, 33, No. 29.

Philip, J. R. (1963).—Recent advances in leucosis research (submitted for publication).

TSETSE AND TRYPANOSOMIASIS CONTROL BRANCH

STAFF

The staff position improved temporarily in that one professional officer was appointed during the year, but this was offset by the resignation of Miss B. Leggate who has made a major contribution to the study of tsetse ecology and the tsetse/trypanosome relationship during her period of office. There were thus three vacancies for professional staff after 31st October 1963. Changes occurred in the field officer staff, but all vacancies have been filled.

The shortage of junior professional staff throws a heavy burden on senior staff and limits the use that could be made of their knowledge and skills. The deteriorating tsetse position in some areas is, to a large extent, due to the lack of professional supervision.

GENERAL

There is a growing co-operation between this Branch and the Ministry of Internal Affairs as their mutual interests become apparent. The implementation of some of the recommendations of the Phillips' Report has brought together administrators, biologists, veterinarians, agriculturists, civil and irrigation engineers and their ancillary staffs to share in common projects. It is heartening to record that the break-up of the Federation of Rhodesia and Nyasaland has in no way dampened the enthusiasm and diligence of officers engaged upon these projects. Special attention is being paid to development in the Binga, Gokwe, Urungwe and Nuanetsi Districts, where settlement is being carried out towards and into territory occupied by tsetse fly.

These activities have thrown further responsibility on the Branch. Whereas its main activity has for some years been directed towards protecting occupied territory along the entire fly front and halting advances of fly in the Nuanetsi, Lupane and Inyanga North area it has now become its task to make inroads into fly country to make further land available for development, particularly in Tribal Trust Lands and Purchase Areas, e.g. North Urungwe, North Sipolilo and Darwin and in Binga and Gokwe districts.

It is becoming a recognized principle, which is being put into practice, that the provision of limiting fences and access roads in settlement areas within or adjacent to tsetse infested country should precede the introduction of cattle. The successful maintenance of cattle adjacent to fly depends upon regular inspection and treatment, and on their physical separation from known fly haunts. In the Copper Queen Native Purchase Area, and in Tribal Trust Lands within the Binga, Gokwe and Urungwe Districts fences have been erected by the Departments of Internal Affairs and of Lands at a cost of many thousands of pounds. It would be sound economy for the owners to set aside one per cent. of the cost for fence maintenance since fences left unattended rapidly deteriorate.

There has been further co-operation between the governments of the Federation, the Republic of South Africa and of Portugal in dealing with the common tsetse problems between the Sabi and Limpopo rivers. The Government of the Republic of South Africa supplied teams to carry out surveys and undertake insecticide spraying operations in south-west Moçambique and in the south-east of Southern Rhodesia and contributed towards the cost of the insecticide.

CONTROL OF TRYPANOSOMIASIS

The numbers of cattle at risk in the various areas of operation, the smears taken and treatments given are summarized in Appendix I. More cattle were inspected than during 1961/62, due to natural increase and to the extension of the disease, more smears were taken and more were found to be positive. During 1961/62, 4.4 per cent. of the smears taken were positive, and in 1962/63, 6.6 per cent. This increase arises from the wide use of berenil, which confers little or no prophylaxis, from a growing accuracy in recognizing clinical symptoms of the disease, but mainly from an increase in the number of cases. It is evident that the number of cattle being maintained in contact with fly by means of drugs is steadily increasing.

TABLE 1: PROPORTION OF DOSES OF TRYPANOCIDAL DRUGS USED IN 1961-62 COMPARED WITH 1962-63

Drugs	*1961-62*	*1962-63*
Antrycide Pro-Salt	24.6	27.0
Antrycide dimethylsulphate . . .	31.0	22.5
Homidium (Ethidium)	6.9	14.9
Berenil	32.7	28.2
Iso-metamidium	4.8	7.5
	100.0	100.1

Less use was made of antrycide dimethylsulphate in favour of Homidium, and more cattle required treatment with iso-metamidium, which is used to eliminate strains of trypanosomes resistant to other drugs.

CONTROL OF TSETSE FLY

Table 2 is a summary of the allocation of funds for the various anti-tsetse measures undertaken by the Branch. Bush clearing and bush control is still the major undertaking. As predicted in the 1961/62 report costs of game destruction increased as a result of the Nagupande Game Control Experiment. There was an increase to cover costs of new camps and repair of existing ones.

TABLE 2: ALLOCATION OF FUNDS 1962-63

	Labour	*Equipment Stores etc.*	*Transport*	*Total*
Bush Clearing and Control	21.9	61.9	3.1	35.0
Game Control . . .	14.2	2.0	4.4	7.2
Surveys and Investigations .	19.9	5.3	11.1	12.1
Insecticides	4.0	19.9	9.2	11.6
Traffic Control . . .	9.4	0.4	1.7	4.2
Fences	6.9	1.9	5.7	4.6
Roads and Airstrips . .	5.3	0.1	6.7	3.4
Camps Costs and Maintenance . . .	4.4	5.9	7.0	5.5
Administration . .	11.7	2.0	47.1	14.5
Miscellaneous . . .	2.3	0.6	4.0	1.9
TOTAL . .	100.0	100.0	100.0	100.0

TRAFFIC CONTROL

The increase in the numbers of *G. morsitans* mentioned in the Annual Report for 1961/62 gained momentum. The number of *G. morsitans* caught per 100 cars increased from 2.13 in 1961/62 to 6.44 in 1962/63, per 100 cyclists from 33.85 in 1961/62 to 81.01 in 1962/63 and per 100 pedestrians from 6.08 in 1961/62 to 18.60 in 1962/63 (Appendix III). These increases of between two and three fold over the 1961/62 figures (Appendix IV) are partly to be explained by the closing of Suskwe Chamber in Mtoko district which has not recorded a capture for some years, partly by the establishment of traffic control points in heavily infested areas of Sabi-West, Binga and Gokwe districts, but mainly by a general increase in catches of fly in all but the Sabi-East and South Lundi areas.

Thirty-one traffic control points are in operation throughout the tsetse areas.

CONFERENCES

Mr. J. Ford, the Assistant Director (Tsetse and Trypanosomiasis Control), was awarded a fellowship under the United Nations Expanded Programme of Technical Assistance to undertake a study of the role of cattle trypanosomiasis in national economics. This study involved visits throughout Africa to examine the environmental, social and economic background of tsetse and trypanosomiasis control schemes in those countries where trypanosomiasis, both human and animal, is a problem. During his tour, he attended the Seventh International Congress of Tropical Medicine and Malaria held at Buenos Aires, Brazil, to deliver two papers on tsetse and trypanosomiasis.

On 5th June, a meeting was held at Chipinda Pools, attended by senior members of the Veterinary Department, the Branch of Tsetse and Trypanosomiasis Control, the Veterinary Department of the Republic of South Africa, and of the Missao de Combate as Tripanossomiases of Moçambique, to plan a joint insecticide-spraying operation in the South Lundi area to halt the advance of *G. morsitans* towards the Limpopo and Nuanetsi rivers.

The Zoological Society of Southern Africa held a symposium on African mammals at Salisbury during September, at which Miss B. M. Leggate delivered a paper on the host relationships of tsetse flies.

PUBLICATIONS

Cockbill. G. F., Lovemore, D. F., and Phelps, R. J. (1963). 'The control of tsetse flies (*Glossina*: Diptera, Muscidae) in a heavily infested area of Southern Rhodesia by means of insecticide discharged from aircraft, followed by settlement of indigenous people.' Bull. ent. Res. 54 (1) pp. 93-106.

The following were presented at international conferences:

Ford, J. (1963). 'The geographical distribution of trypanosome infections in African cattle populations.' Seventh International Congress on Tropical Medicine and Malaria. Rio de Janeiro, 1963.

Ford, J. (1963). 'Recent advances in biology of *Glossina* in relation to techniques for its control.' Seventh International Congress on Tropical Medicine and Malaria. Rio de Janeiro, 1963.

Ford, J. (1963). 'The distribution of the vectors of African pathogenic trypanosomes.' Bull. Wld. Hlth. Org. 1963. 28, 653-669.

Leggate, B. M. (1963). 'The natural food hosts of tsetse flies.' Symposium on African mammals. Zoological Society of Southern Africa, Salisbury.

AREA REPORTS

1. North-West Front

Binga-Lupane

The major activities in this area were directed towards arresting the extension of *G. morsitans* southwards towards the Gwaai and Shangani rivers. Bush clearing by means of hand labour was carried out within the riverine fringes of the Shangani drainages. The Dongamusi and Mzola rivers, and the Shangani River from the Tjotjolo weir to the confluence of the Shangani and Kana rivers were cleared of vegetation likely to harbour fly since the operation commenced in June 1962. In all a total of 29 miles of riverine on each bank were cleared during the year. Clearing already undertaken on the European-owned Karna Block Ranch will be extended to include all likely tsetse habitats.

The treatment of vegetation on the Shangani drainages with a persistent insecticide, begun in September 1962 and completed in October 1962, was resumed and extended in August 1963. This latter operation is still in progress. The 1962 operation expended 10,530 gallons of 3.7 per cent. dieldrin emulsion at the rate of approximately 13 gallons per machine mile. Application was made by means of motorized knapsack sprayers to selected vegetation within the areas surrounding the dips which have shown fairly regular infection (Sedendhle, Tjotjolo North, Tjotjolo South and Manganganga dips in the Tribal Trust Land area and the European-owned Karna Block Ranch).

The 1963 operation was designed to cover the Mzola drainage upstream of the bush cleared areas, the Dongamusi drainages and the vegetation surrounding Cewali pan. This operation is being carried out using pneumatic knapsack sprayers. The application rate is approximately 11 gallons per machine mile, which is less than that expended when motorized sprayers were used, and indicates that greater selectivity is being achieved.

These measures have been reinforced by settlement of people on the Dongamusi and Mzola drainages to consolidate the gains made. During August, 35 cattle were moved into the Dongamusi paddock, which in September, produced 14 positive cases of trypanosomiasis.

The beneficial effect of these operations is reflected in the decline in trypanosomiasis cases from 193 during 1961/62 to 51 during this year at the infected dips Sebendhle, Tjotjolo North and South, Manganganga and Nduna. There has also been an improvement on Karna Block Ranch. This improvement is further emphasized if the change in drug treatment is considered. During 1961/62, A.D.M.S. and Homidium were used to treat all animals exposed to the risk of infection. These drugs possess varying degrees of prophylactic action which doubtless prevented infections and reinfections from becoming patent. The total of 193 recorded infections for 1961/62 was thus less than what might have been expected in the absence of prophylaxis. During 1962/63 the drug Berenil was used for curing individual cases of the disease. For practical purposes, this drug can be regarded as conferring no prophylaxis, and therefore that most of the animals bitten by infected flies would have developed the disease. No tsetse flies were caught in this area. No cases were reported from Sotane Ranch south of the Gwaai River.

In the Binga District despite the very wet season (40 inches of rainfall were recorded), routine inspections and treatments were maintained. At the heavily infected centres Siansali, Masumo and Manjolo, where drug fast strains had become an added problem during 1961/62, the use of iso-metamidium resolved the position. The success of this routine chemotherapy has been demonstrated by the fact that cattle within these fly infested areas increased by 15 per cent. from 5,564 in October 1962 to 6,425 at the end of September 1963 despite the very heavy trypanosome risk.

In the west of the Binga District, at the centres Sebungwe, Siachalaba and Mlibizi infections are becoming more frequent. Tsetse surveys carried out along the Mlibizi and Siazundu rivers confirm the view that *G. morsitans* is advancing in a westerly direction in this area towards the Binga-Kamativi road. The situation is being carefully watched.

In the east, on the drainages of the Lutope and Sengwa rivers, *G. morsitans* is becoming more abundant, particularly in the Malimasimbi area, and further west in the Kenyandavu area. Infections in the Lutope cattle are increasing. The settlement projects planned for the Lutope basin may be prejudiced by the growing pressure of fly from the north. The actual occupation of this area is proceeding very slowly, and it is becoming evident that further control measures will have to be taken in the area to maintain the position until settlement has progressed far enough to exert its influence on fly habitat.

Operations have extended so far to the east from Cewali, the headquarters for the area, that there is an urgent need to establish an additional operations headquarters with a senior field officer in the Lutope-Sengwa area.

The *G. morsitans* population in the Lubu Valley remains at a low level. This area was treated in 1957 with insecticide discharged from aircraft. The area of cultivation by the residents is extending and the valley is becoming less capable of supporting fly.

Gokwe

This area has suffered particularly from staff difficulties. One senior field officer resigned during the year, and two field officers were absent for long periods of illness. Intensive patrols and the use of test herds of cattle have revealed that *G. morsitans* and cattle trypanosomiasis are now present along the west bank of the Umniati-Sanyati rivers. This must be regarded as a serious deterioration. It is several years since, as a result of game elimination, this area was regarded as being free of tsetse. It is now possible to find *G. morsitans* coming to vehicles travelling between Copper Queen Mine and Marowa. An entomologist is engaged on a detailed survey of the Chenjiri Native Purchase Area and Umfuli Native Purchase Area. This is rough country, mostly unsuitable for agriculture, from which fly is not likely to be eliminated by bush clearing and application of insecticide alone.

In response to the increased activity of the Department of Internal Affairs in developing the Binga and Gokwe Tribal Trust Lands a Tsetse Field Officer was established in a camp on the Manyoni River, and patrol activities organized. The Branch's Survey Ecologist in conjunction with officers of the Southern Rhodesian Ministry of Agriculture and of the Development Section of the Ministry of Internal Affairs selected access routes and defined the boundaries of the Mbungu and Lutope paddocks. He also surveyed a descent of the Charama Plateau to provide easier communication between Gokwe and the Sengwa area. The provision of roads in this area has accelerated development operations.

In areas adjacent to tsetse fly where cattle exist but where access is restricted for part of the year, treatment of stock is inevitably irregular. Under these conditions, resistance to prophylactic drugs is likely to occur. This happened in the north-east Gokwe area, in cattle associated with the dips Gorodema, Gwave and Nemangwe. Sanative treatment was given.

The provision of fenced paddocks with adequate access roads by the Ministry of Internal Affairs has made it possible to allow cattle to be introduced with some anticipation of permanence. Cattle are being introduced at Mbungu, but so far there has been little response in the Kenyandavu/Dandanda paddock. Bush clearing on the Urongaronga River has been undertaken to protect cattle in the Lutope paddock from fly.

Farms have been delineated in the Copper Queen Native Purchase Area for alienation by the Department of Lands. Conditions imposed by the Veterinary Department limiting the introduction of stock into these areas, were the provision of all-weather access roads and erection of fences to prevent cattle straying into tsetse-infested country. These conditions are being complied with by the Department of Lands. A fence has been built and a main access road is nearing completion. In order to avoid hardship to those who have taken farms, draught oxen have been permitted to enter the farms before the completion of the fencing. From experience gained from running a test herd at Marowa it can be predicted that cattle brought into these farms will contract trypanosomiasis within a few months.

Cattle increased in the infected areas from 14,889 in October to 15,215 to date, from which 6,060 blood smears were taken yielding 329 positives. This represents 5.4 per cent. or an increase of 0.9 per cent. over the incidence during 1961/62. Captures of *G. morsitans* on fly patrols and at the traffic control points within the area (see Appendix III) indicate a marked increase in the availability of this species.

Fly surveys and data from test herds of cattle show that there has been an advance of *G. morsitans* eastwards and to the south-east along the fly front from Ganderowe on the Sanyati River to Nembudzia in the south. The greatest extension has occurred in the Mtungi pan—Marowa River area. A few captures have been made as far to the east as our Sanyati camp and the Urunga River. This year 13 cases of trypanosomiasis occurred in the Marowa test herd; all were *T. vivax*.

2. ZAMBEZI FRONT CENTRAL

Urungwe

There has been a marked increase in the recorded cases of cattle trypanosomiasis in the Urungwe area, from 28 in 1961/62 to 110 in 1962/63. Of these 58 occurred on the European-owned farms in the north-east near Manyangau, 37 amongst African-owned cattle on the Miami Crown Lands and the remainder from the recently occupied farms on the Vuti Block. This increase coincides with a great increase in the numbers of *G. morsitans* on fly patrols, on fly rounds and at traffic control points throughout the area. A contributory cause, which will become increasingly apparent is the extension of settlement towards and into areas infested with fly, particularly in the Vuti and Miami areas.

Cattle in the infected area increased from 3,010 head (Annual Report 1961/62) to 4,203 at present. The Government-owned herds were finally sold by June 1963, but one test herd of 56 animals is left intact at Magororo. Strong recommendations have been made to the Ministry of Internal Affairs to establish a test herd in the Gache Gache area to indicate the incidence of trypanosomiasis in this undeveloped zone.

The fences in the Urungwe Tribal Trust Land were reconstructed by the Ministry of Internal Affairs from funds provided by this Branch for African settlement as an anti-tsetse measure.

In order to protect the north Karoi farms from an extension of *G. morsitans* and *G. pallidipes* along the Rekomitjie drainages, a clearing operation by means of hand labour was undertaken to remove riverine vegetation from these rivers. This operation is still in progress. It continues satisfactorily despite difficulties in recruiting suitable labour.

The recrudescence of *G. morsitans* in the Kanyati Native Purchase Area, west of the Urungwe Tribal Trust Land is also being dealt with by clearing the riverine vegetation on the Kapondo drainages.

A constant check is kept on the tsetse population by means of regular patrols. There is evidence of a marked increase in the population of both *G. morsitans* and *G. pallidipes* along the Kariba Lake shore, between the Gache Gache and Naodza rivers and in the Charara valley. An increase in the incidence of human trypanosomiasis in this area would not be unexpected.

Game animals have been seen more frequently along this fly front. Elephants have been particularly numerous. Their presence will be an embarrassment to the development of the Mkwichi, Miami and Vuti settlements.

Lomagundi

No cases of trypanosomiasis were recorded, but one *G. morsitans* was taken at Vrede Farm, North Doma in January. Following the capture, a traffic control point was established at Tondongwe, from which 12 *G. morsitans* were recovered from southbound pedestrians and cyclists to date.

Tracks are being developed in preparation for more intensive surveys in this area.

Sipolilo

In anticipation of development in the Dande Tribal Trust Land area a field officer has been stationed at Sipolilo. Preliminary surveys by this officer have revealed *G. morsitans* in low density at the junction of the Utete and Msengedzi rivers, and on the headwaters of the Nahome and Kadzi rivers, and *G. pallidipes* has been found in the escarpment foothills.

A temporary traffic control point yielded 10 *G. morsitans* from traffic using the escarpment road to Sipolilo after two weeks' operation in September. A permanent control point will be set up. This area will receive close attention during 1963/64.

Darwin

Much of this area is inaccessible during the wet weather, and the Branch's knowledge of the tsetse and trypanosomiasis position is limited and uncertain. The disease appeared again in Mazarabani in November 1962 and continued throughout the year involving, up to now, five centres. There has been a determined effort by the Ministry of Internal Affairs to provide access roads and cattle inspection facilities. It is hoped that these will be available before the next rains.

The 129 cattle moved into Gutsa Tribal Trust Land area during August 1962 developed a high incidence of disease. All animals were treated with antrycide pro-salt during November in an attempt to carry them through the wet season while they were inaccessible for inspection. No animals had died by May when inspections were resumed, but if these animals are to survive, facilities for regular inspection must be provided.

Information regarding Chiswiti Tribal Trust Land area is also vague. Communications are bad and the position is made worse by lack of co-operation from cattle owners. There were 14 positive blood smears taken from cattle, but many clinical cases and unexplained deaths occurred.

Six cases were confirmed from Nyanheye in Chimanda Tribal Trust Land during April and May.

3. NORTH-EAST FRONT

Mrewa, Mtoko and Inyanga Districts

No cases were reported from the Fungwe Tribal Trust Land. Roads and inspection facilities have now been provided in the area to the east of the cattle fence, which had been denied to cattle since 1953. The area has now been restocked with 277 head, from which 320 smears were taken, all of which were negative.

A severe outbreak of trypanosomiasis in the Mtoko Tribal Trust Land occurred during February, involving the dips, Kawire, Mfawa, Kapondoro, Masunzwa and Kaitano. At Kapondoro, 60 cases were recorded over a period of six weeks. Infections were sporadic however, and readily responded to treatment. Co-operation from the cattle owners was good. This outbreak increased the number of cattle requiring inspection in the Mtoko Tribal Trust Land from 6,467 in October 1962 to 12,568 in September 1963. This increase in inspection and treatment has necessitated the establishment of an additional A.H.I. at Mtoko.

As a preliminary to the introduction of cattle, test herds had been strategically placed in the western and southern areas of Special Native Area 'C' for a period of two years to indicate the incidence of trypanosomiasis. The indications were that cattle could be introduced. At the present time 1,100 head have been brought into this area. Trypanosomiasis has appeared amongst the cattle, but has been controlled by treatment of individual animals with curative drugs. The test herds have now been distributed over the northern and eastern areas based on dips and water facilities provided by the Ministry of Internal Affairs to indicate the practicability of introducing African-owned stock to these zones.

The bush-clearing operations by means of bulldozers begun in May 1962 in the Mtoko district were completed in May 1963. Potential fly habitat along the banks of the Mudzi, Nyamsansara, Nyamapanda and Utsinga rivers were cleared, and woody vegetation was removed for a width of 100-150 yards along the game fence on the international border between the Ruenya and Mazoe rivers. The total area cleared amounted to 3,597 acres at a cost of £9 15s. 9d. per acre. Areas inaccessible to the bulldozer were cleared by hand, bringing the total cost (with transport) to £10 7s. 9d. per acre. The cleared areas along the Mudsi River are available for voluntary settlement by people from Mkota Reserve. These people are not cattle owners and are the most likely to be attracted to the area.

The spraying operations carried out during September 1962 in Chikwizo Reserve and Inyanga North were successful in reducing the incidence of fly on some rivers and eliminating it on others. The incidence of fly in Chikwizo Reserve is so low that the effect of the insecticide cannot readily be assessed in terms of reduction in the catch of fly. However, the occurrence of trypanosomiasis in the Zano cattle may be taken as an indication since they have been treated throughout with Berenil, which has little or no prophylactic effect. During October 1962, the month following the treatment, six cases of trypanosomiasis were recorded. No cases were recorded in November, December or January 1963. Biological tests carried out on samples of the insecticide deposit have indicated that it is active for at least 100 days. It seems that the cattle were protected for a similar period. Cases have increased since January. Comparison may be drawn with the incidence of disease in the Chikwizo cattle, which graze outside the area treated with insecticide. During the period of the spraying operations, and for four months subsequently, infected and clinical cases were treated with Berenil. In October 33 cases were recorded and treated, in November four cases and in December three. In January 1963, 18 cases occurred. Trypanosomiasis was thus more prevalent in the untreated area than in the treated.

The discovery of a few, but persistent *G. morsitans* in the north-west corner of Chikwizo Reserve on the Zituri, Nyakuranga and Nyabopoto rivers and other drainages of the Nyamsansara river led to the treatment of this area with 3.7 per cent. dieldrin emulsion in September 1963. Although the Chikwizo cattle were officially denied this area for grazing, they did use it and apparently contracted trypanosomiasis as a result of contact with the very light fly infestation.

The spraying operation was a repetition of the 1962 undertaking. Resting sites along the drainages and cattle paths in north-west Chikwizo and in Inyanga North were treated with 3.7 per cent. dieldrin emulsion applied by means of Favori-Colibri pneumatic knapsack sprayers. Particular attention was paid to rot holes, rocks and fallen logs. A total of 5,427 gallons of emulsion was applied in 2,260 machine hours to 416 machine miles of traverse, at the rate of 13 gallons per mile. The drainages served an area of 47.5 square miles. The cost of insecticide, labour, rations and transport amounted to £2,906 and the cost per acre to 1s. 11d.

The full effect of this operation will not be apparent for some time, but patrols carried out since the treatment indicate that the catches of fly are greatly reduced.

Infection has intensified and spread within the Inyanga North area. It is present at all centres throughout the year. To deal with this situation, 5,200 head of the cattle population are now treated every two months with antrycide prosalt, using Berenil regularly to eliminate incipient resistance. Overstocking has aggravated the problem. In 1958 there were 450 head at Fombe; now there are 850. Infections have appeared as far west as Saramukarima dip in Chikore Tribal Trust Land, and at Nani. Dips at Matisi Native Purchase Area show infections continuously. During the year 3,085 smears were taken, of which 257 were positive.

The position warrants the establishment of a new Tsetse Field Station in the Chifambe area with facilities for conducting tsetse and ecological surveys between the Ruenya and Gairezi rivers. The agricultural potential of this area is so low that further settlement of people is unlikely to play much part in providing a barrier to incursions of fly from Portuguese Territory. It is likely that the extended use of bush clearing and insecticides will remain the control methods of choice.

The effect of insecticide treatment carried out in September was assessed solely by the capture of fly, since the cattle are maintained on the prophylactic drug iso-metamidium, which masks the incidence of trypanosome infection.

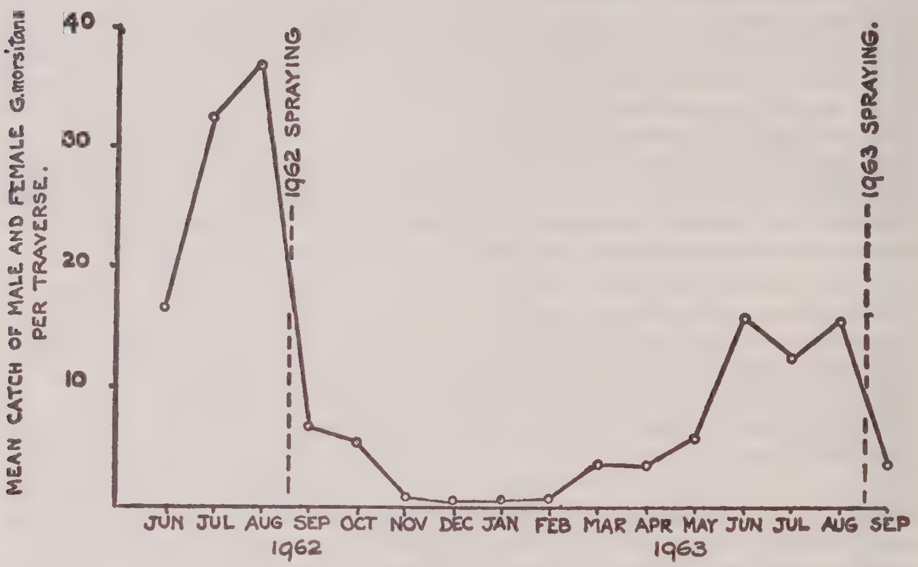


Figure 1

Figure 1 shows the number of male and female *G. morsitans* caught per traverse per month before and after the 1962 spraying, and also on the first traverse after the 1963 spraying of the same area. Treatment was followed by a sharp and progressive decline in the numbers of flies caught which persisted for about five months before a recovery became apparent. The 1963 operation appears to have brought about an initial decline in the number of flies caught on patrols. Samples of bark from treated trees were taken for chemical and bio-assay. Through the kindness of Messrs. Shell Chemical Co. Ltd., chemical analyses were carried out on samples taken on the day of treatment and one month after treatment. Analyses revealed that spraying with a 3.7 per cent. dieldrin emulsion resulted in a mean maximum deposit of 100 mgm. and mean minimum of 45 mgm. per square foot on trees with smooth bark and a mean maximum of 110 mgm. and a mean minimum of 50 mgm. on trees with rough bark. After exposure for one month the dieldrin concentration had fallen to a half of these quantities. At this concentration, however, it gave 100 per cent. kill of *G. morsitans* in less than four hours. It is interesting that three bark samples of a batch of nine tested against *G. morsitans* eleven months after application gave 100 per cent. kill with less than four hours' exposure. The chemical analysis from comparative samples of bark is awaited.

4. South-East Front

Chipinga District: The Border Clearing and Associated Farms

All four species, *Glossina brevipalpis*, *G. pallidipes*, *G. austeni* and *G. morsitans* in that order of abundance were taken adjacent to or within the border clearing, all inside Portuguese Territory. The records over the past five years show that captures of *G. brevipalpis* and the trypanosomiasis cases on the farms adjacent to the border both occur most frequently in March and April. *G. pallidipes*, on the other hand, is caught most frequently in October and November. The suggestion is that *G. brevipalpis* is still the most important vector of bovine trypanosomiasis adjacent to the border clearing.

Clearing regrowth and annual burning continued as usual.

The fence along the international border on Tamandayi was completed by the end of October 1962. Cattle will be permitted on Tamandayi when the internal fencing has been constructed.

On the European-owned farms 78 cases of trypanosomiasis were recorded, 24 of which occurred on the farm Wolverhampton, between April and June, adjacent to the homestead buildings, and within half a mile of the international boundary. Despite intensive searching in the vicinity no evidence of tsetse flies was found. All regrowth that could possibly harbour fly was removed in June by a labour gang, since when no more cases have been observed. The disappearance of the disease followed so abruptly on the beginning of regrowth slashing that it is unlikely that this measure played much part in clearing up the disease. The reasons for the sudden occurrence and disappearance of these infections remain obscure. It is worthy of note that no cases occurred this year on the farms Lettieswan or Sterling, associated with the Inyamadzi drainages.

One case of trypanosomiasis occurred in the Melsetter District in an animal that had been purchased within the infected Sabi area.

The situation in the Musikavanthu and Ndowoyo Tribal Trust Land is grave. A record number of cases was recorded this year. Out of 888 cases in the Chipinga District 809 were from 13 dips in African areas. Dips adjacent to the Portuguese East Africa border yielded 790 cases, of which 634 were in cattle associated with the 'border' dips Mwangazi, Mariya and Zamchiya. It is anticipated that infections will soon appear at the 'river' dips.

Although the number of recorded cases exceeds the annual totals for the serious 1959-61 outbreaks, the situation differs in that prophylactic treatment with antrycide pro-salt was then given, but in this outbreak Berenil alone is being used. Nevertheless, the situation is serious. Bush-clearing operations carried out in the Lusongo and Mwangazi areas during 1960 and 1961 were followed by a decline in the number of trypanosomiasis cases during 1962. It seems, however, that this improvement was short-lived. Trees and dense vegetation in these areas left by the bulldozers are being felled or ring-barked by hand labour, and settlement on a voluntary basis is being encouraged. Particular attention is now being given to the drainages of the Umsilizwe and Mwangazi rivers where survey patrolling has recently been resumed.

This is an area which sadly lacks the attention of a resident entomologist.

Bikita and Ndanga Districts—Sabi West

There has been a marked improvement in the trypanosomiasis position in the Sangwe Reserve and on Humani Ranch and the Msapas section of Devuli Ranch, but on Lone Star Ranch there has been a temporary deterioration. The westerly advance of the fly belt south of the Lundi has been impeded as a result of a combination of bush-clearing and use of insecticide. The insecticide operations were again conducted with the co-operation of a team from the Department of Veterinary Services of the Republic of South Africa.

No cases of trypanosomiasis were recorded from Humani Ranch and only two (both *T. vivax* in October 1962) from Msapas Section of Devuli Ranch. During the previous year 59 cases were reported on Humani and 22 on Msapas. At the time of the acute situation on Humani Ranch the Department of Conservation and Extension drew up detailed proposals for the clearing of the vegetation bordering the Turgwe river and subsequent utilization of the cleared land. However, as the situation continued to improve, and as resources were urgently needed elsewhere, no bush-clearing was started. A careful survey was made for tsetse fly by means of patrols and specially designed traps, but none was caught or seen.

Only six cases of trypanosomiasis were recorded in the former Sangwe Reserve, all from Gudu's dip. In the northern part of the former Ndanga East Reserve, (now incorporated in Sangwe T.T.L.), no cases occurred at Muteyo dip, and only seven at Rupangwaan's, where last year 31 cases were recorded. In the southern part of this Reserve, served by Peri dip, the 37 cases recorded this year more than trebled the number for last year. Most of these infections occurred in cattle grazing to the extreme south of the Reserve, namely in the Murondozi river area at the north-eastern foothills of the Chuhanja Hills. This area is known to have been highly infested with both *G. morsitans* and *G. pallidipes* for some years. It is inevitable that infections will occur in these cattle if they are permitted to graze into these hills.

During mid-1962, *G. morsitans* was found near the Lundi river, within the boundary of Lone Star Ranch. Intensive surveys revealed low density *G. morsitans* on the Chiloveka and Mahonde rivers which drain into the Lundi. The head-waters of these rivers approach the Chuhanja Hills where concentrations of *G. morsitans* can be found. To deal with this situation, riverine vegetation was sheer cleared from the Lundi river drainages between 'No. 1' pool and the Chiredzi confluence, and in August and September a 3.1 per cent. dieldrin emulsion was applied to remaining vegetation on the Lundi and to that fringing the banks of the Chiredzi, Mahonde, Chiloveka, Mande and Golojo rivers draining to the Lundi from the north and of the Tchingwedzi and Machiroro rivers draining from the south. To prevent cattle straying from Lone Star Ranch towards the lower Lundi and the Chuhanje Hills, efforts were made, as an elementary precaution, to have a fence erected along the southern boundary. Poles were erected, but the fence is still devoid of wire.

The outbreak of trypanosomiasis on the southern part of Lone Star Ranch in June 1962 was followed by a block inoculation of the cattle with Berenil and their transfer to the northern portion, where they have remained with only six further cases. African-owned cattle from the vicinity of the Chiredzi river yielded 16 cases. A test herd of 50 heifers was retained near the infested Chiloveka-Mahonde portion of the ranch for the purpose of detecting the presence of the disease. During October and November 1962, following the application of 3.7 per cent. dieldrin to the Mahonde and Chiloveka drainages, only one *T. vivax* infection was recorded, but from December the cases increased in number to August 1963, indicating a heavy challenge. Of 1,314 smears taken from these animals 134 were positive predominantly *T. vivax*. These cattle were treated in August with Berenil which cleared all infection, and were then moved to another part of the ranch. They were thus not available to measure the effect of the spraying operations carried out during August and September 1963. It is intended to re-introduce a test herd to the area when grazing becomes available.

The spraying operations on Lone Star Ranch referred to in the 1961/62 Annual Report were carried out as planned. During October 1962, selected sites along the Mahonde, Chiloveka and Lundi rivers were treated with a 3.7 per cent. dieldrin emulsion applied by means of pneumatic knapsack sprayers. This operation used 360 gallons of Dieldrex 15 'T' insecticide.

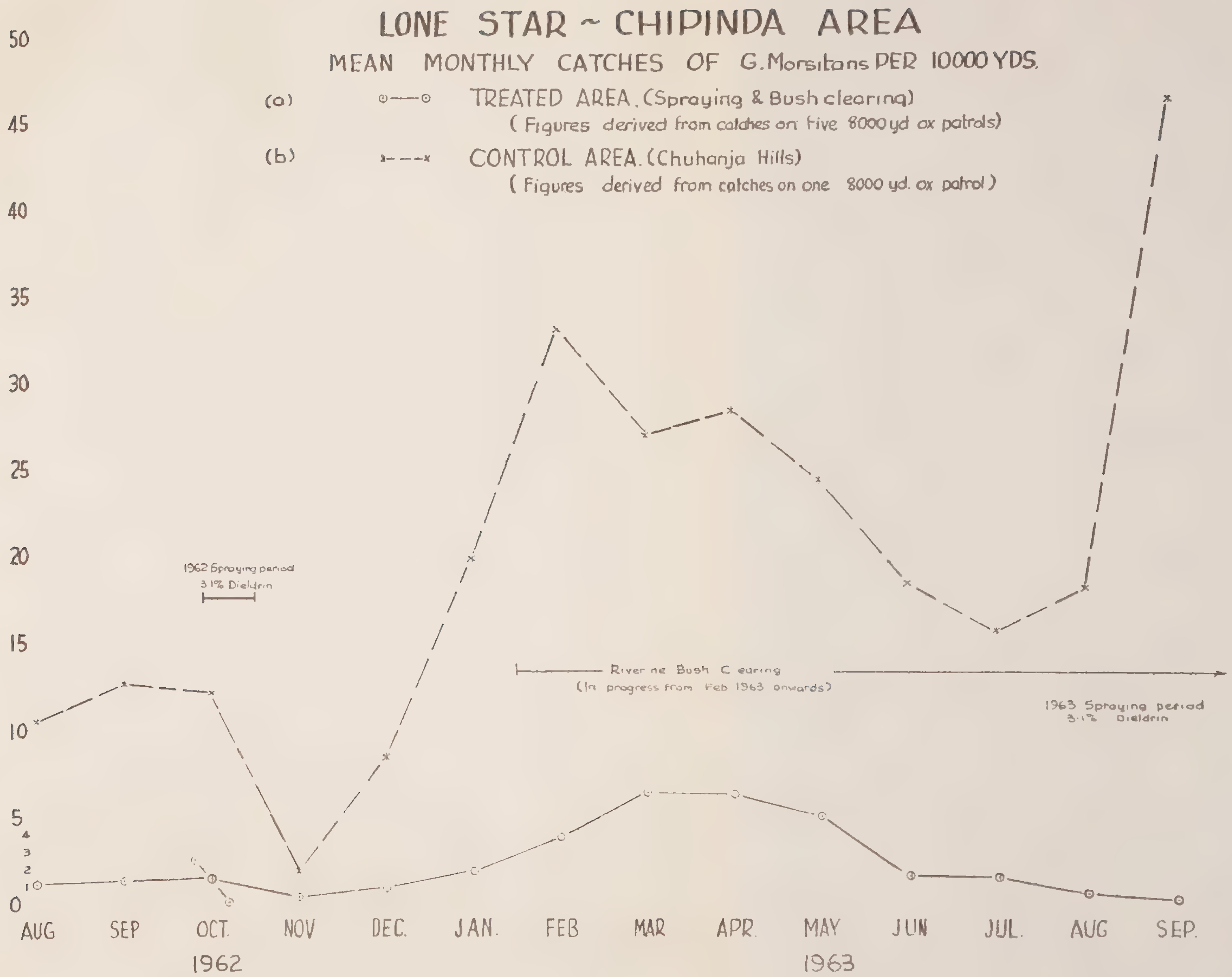
A further and more extensive operation was carried out during August and September 1963. Between 12th August and 27th September 1963, 156 miles of drainages were treated with a 3.1 per cent. dieldrin emulsion, applied by means of motorized knapsack sprayers. The treated areas included the actual and potential fly habitat on the Lundi river system between the Chiredzi confluence and Chipinda Pools, with special attention being given to parts of the Chiredzi, the Mahonde and Chiloveka, and a band of vegetation about 60 yards wide running along the foot of the Chuhanja Hills for about 12 miles. The consumption of Dieldrex 15 'T' was 680 gallons, at a cost of £1,445, and transport and labour cost £350 (excluding cost of supervision). During the operation a fierce grass fire swept through the area. Experience has shown that such fires can reduce the effective insecticide deposit by as much as 80 per cent., but that the residue is still lethal to tsetse flies. However, as an added precaution, portions of the Mahonde and Chiloveka rivers were treated again with insecticide.

In support of these operations, bush clearing has been extended within *G. morsitans* habitat on the Chuhanja Hills, and along drainages running from the hills towards the Chiredzi ranches. A game fence has been erected from the south-eastern beacon of Lone Star Ranch to the southern boundary fence of the Sangwe T.T.L., which continues to the Sabi river.

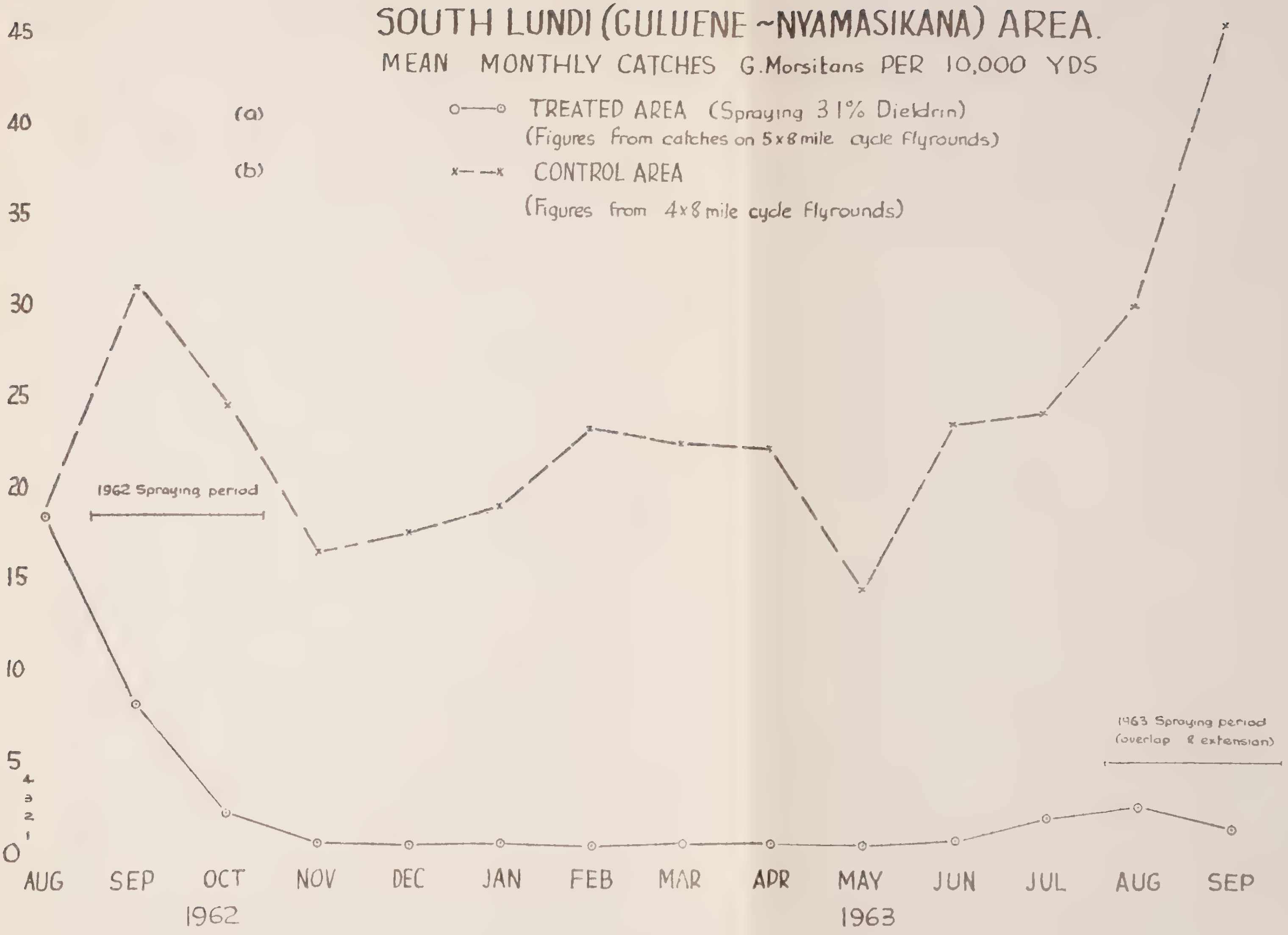
The effect of these operations on the catch of *G. morsitans* on patrols with bait oxen carried out within the treated area, is shown in Fig. 2.

A comparison can be drawn with catches made on a flyround within the Chuhanja Hills which were not influenced by the treatments. Graph (b) shows that seasonal maxima occurred during the late dry season (September and October 1962), at the end of the wet season February to April 1963, and in September 1963. The spraying carried out during October 1962, Graph (a), was followed by a drop in catch to 0.25 flies per 10,000 yards of traverse. The population thereafter followed the general behaviour seen in the control (b) until the August/September 1963 spraying, but the more gradual increase probably reflects the effect of bush clearing operations. The change in behaviour after July 1963 is apparent. The population in the Chuhanja Hills increased rapidly, but the population within the treated area dwindled again to 0.25 flies per 10,000 yards of traverse. This represents a catch of only four flies over ninety-one miles of bait oxen patrols. This is an encouraging sign, particularly as the spraying operation was in progress until September 27th. Captures at traffic control points also indicate fewer flies in the treated area.

An improvement in the tsetse and trypanosomiasis position on Lone Star Ranch during 1963/64 can be contemplated with some confidence.


LONE STAR ~ CHIPINDA AREA
MEAN MONTHLY CATCHES OF G. Morsitans PER 10000 YDS.
(a) TREATED AREA. (Spraying & Bush clearing)
(Figures derived from catches on five 8000 yd ox patrols)
(b) CONTROL AREA. (Chuhanja Hills)
(Figures derived from catches on one 8000 yd. ox patrol)
1962 Spraying period
3·1% Dieldrin
Riverine Bush Clearing
(In progress from Feb 1963 onwards)
1963 Spraying period
3·1% Dieldrin
50
45
40
35
30
25
20
15
10
5
4
3
2
1
0
AUG
SEP
OCT.
NOV
DEC.
JAN.
FEB
MAR
APR.
MAY
JUN
JUL.
AUG
SEP.
1962
1963

[Figure 2]


SOUTH LUNDI (GULUENE ~NYAMASIKANA) AREA.
MEAN MONTHLY CATCHES G.Morsitans PER 10,000 YDS
(a) o—o TREATED AREA (Spraying 3·1% Dieldrin)
(Figures from catches on 5×8 mile cycle flyrounds)
(b) x– –x CONTROL AREA
(Figures from 4×8 mile cycle flyrounds)
1962 Spraying period
1963 Spraying period
(overlap & extension)
45
40
35
30
25
20
15
10
5
4
3
2
1
0
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
1962
1963

[*Figure 3*]

Nuanetsi District—South Lundi

There was a serious deterioration in the trypanosomiasis position during the year on Matibi No. 2 T.T.L. Infections at Chambuta and Chibgwedziwa dips became so numerous that all cattle received treatment with Atrycide D.M.S. in February. Cases also occurred at Machindu for the first time on record, and at Chilongo for the first time since February 1958. One case appeared in May 1963 at Gulungwene dip. This is the first record of trypanosomiasis west of the Lourenço Marques railway line. Antrycide resistance was suspected in the Chambuta cattle and Berenil was used as a sanative during July and September. The number of cattle requiring inspection during 1961/62 was 2,323. Now 7,739 are under inspection. Of 959 smears examined 173 were positive, of which 141 showed presence of *T. vivax*.

The occurrence of trypanosomiasis thus suggested a limited westward advance of tsetse fly in this area. This view was confirmed in July 1963 when a bait ox survey of the Machiroro drainage, a tributary of the Lundi, recorded small numbers of *G. morsitans*. Immediate action was taken to deal with the situation. Vegetation fringing the Machiroro river was cleared to supplement the clearing which had already been carried out along 9.3 miles of the Tchingwedzi River and all of the south bank of the Lundi between these two rivers. These rivers and their associated drainages were also sprayed with 3.1 per cent. dieldrin emulsion in the course of the North Lundi operation during September 1963. It is too soon to comment on the results of this operation, but a survey of the Machiroro river after the spraying failed to find any fly. The future incidence of trypanosomiasis in the Matibi No. 2 cattle will be an indication of the effectiveness of these treatments.

The Annual Report for 1961/62 described a joint spraying operation carried out with the co-operation of a team from South Africa in the Gona-re-Zhou region of the south Lundi area which was still in progress at the end of September 1962. This operation was concluded on October 24th 1962. It was designed to reduce the pressure of fly towards the 40-mile-long and 10-mile-wide protective barrier of discriminative clearing that had been created along the eastern side of the Chikombedzi-Malvernia stretch of the Lourenco Marques railway line in 1960/61. As a result of the pupal surveys carried out by the South African team, the Nyamasikana, Guluene and Chefu rivers with their associated drainages were selected for treatment. Treatment was confined almost entirely to drainage lines, the dominant feature of which was the evergreen thickets of *Androstachys johnsonii*, as these had been found to provide the principal dry season breeding sites for *G. morsitans*, but vegetation lining pans and road verges and 'contact' vegetation between *Brachystegia* and other types of woodland were also treated. Application was made to 230 miles of drainage lines, 17 miles of 'contact', 7 miles of road and 4 miles of edges of pans, within an area of 350 square miles. In this operation 1,720 gallons of Dieldrex 15 'T' costing £3,655 were used. The total cost of the operation (excluding salaries of professional staff) was £9,162, which was shared approximately equally by the Federal and South African Governments, giving a cost per acre of 9.8 pence.

Fig 3 illustrates the mean monthly catches of male and female *G. morsitans* per 10,000 yards of traverse on bicycle patrols eight miles in length, carried out within the sprayed area (a) and on similar patrols carried out in the heavily infested country bordering the Lundi river to the north-east of the sprayed area (b).

The control catches (b), follow the same pattern as those in Fig. 2. Seasonal maxima occurred in September/October towards the end of the 1962 dry season, at the end of the wet season from February/April 1963, and again in September 1963. The application of insecticide was followed (a) by a sudden and progressive decline in the mean monthly catch. By November 1962 the reduction from the August catch was more than 97 per cent. The event of greatest significance is that the seasonal increases recorded in the catches on the control fly patrols did not occur on those carried out within the sprayed area.

The success of these operations encouraged further collaboration with the South African team during 1963. Surveys carried out by the South African team during the dry season of 1963 had shown that *G. morsitans* was still lingering on some of the treated drainages. It was therefore decided to respray those stretches of the Nyamasikana system which had been sprayed in 1962 where *G. morsitans* could still be found, to extend the treatment downstream along the Nyamasikana and also to include the Benji river system. The South African team undertook to supervise and carry out this work unaided, apart from assistance in providing a source of fuel and oil for transport and the provision and maintenance of the motorized knapsack sprayers and operators used in this operation. The available resources of this Branch could thus be concentrated in the North Lundi/Lone Star Ranch area.

In this operation 995 gallons of Dieldrex 15 'T' were applied as a 3.1 per cent. dieldrin emulsion, in 35 working days, over 169.5 miles of riverine and other vegetation. It is too early to comment on the effects of this operation other than to note from (a) in Fig. 3 that there was no evidence of the sharp seasonal increase in catch for September 1963 such as occurred on the control fly rounds.

A more delicate indicator of the effect of control measures applied in areas where fly populations are low is the incidence of trypanosomiasis in cattle grazed strategically within or near the treated area. As a supplement to the flyround patrols, four test herds, each of 21 cattle were maintained in the area, two along the railway line, at Nyala and Tswiza siding respectively, and one on the upper Guluene River at Naivasha. The fourth was stationed at No. 2 Borehole on the Guluene. These herds grazed in a set pattern so that two would sample the western (outer) edge of the discriminately cleared barrier and two the eastern edge nearest to the fly advance. Of the westerly herds the southern herd at Nyala showed absence of infections, but in the northern herd at Tswiza, four *T. vivax* cases were recorded, one per month in February, April, May and September. No records of tsetse flies have been made within 10 miles of this herd, which demonstrates the value of a test herd in detecting the presence of the occasional fly, and more particularly emphasises the continuing threat of a tsetse fly advance towards the Nuanetsi river and westwards to the ranching areas.

Trypanosomiasis occurred more frequently in the two eastern herds, as might be expected. From February to September, 12 *T. vivax* infections appeared in the Naivasha herd and from June to September 17 *T. vivax* and 3 *T. congolense* infections in the Borehole No. 2 herd.

An important development bearing on the Branch's activities was the extension of the Matibi No. 2 Tribal Trust Land to include a further quarter million acres of the Gona-re-Zhou Game Reserve. As a condition to the introduction of stock, a cattle fence was to be built within this extension beyond which cattle would not be allowed. This fence has now been completed. Between this fence and the extension boundary, people would be allowed to cultivate without livestock. Money has been provided on estimates for this Branch to erect a game fence on the prescribed boundary of this extension to run from the railway line to the Lundi river. The Ministry of Internal Affairs have already co-operated in this project by cutting the line for this fence. It is the intention to maintain the zone between these two fences free of cattle and game to break contact between the game within the Gona-re-Zhou Game Reserve and the cattle of Matibi No. 2 Tribal Trust Land.

THE NAGUPANDE GAME ELIMINATION EXPERIMENT

The course of the infection of the cattle in the Gwaai-Shangani area and the distribution of fly indicated that the headwaters of the Nagupande river covering about 200 square miles were the likely source of the vector. The area was heavily infested with *G. morsitans,* and game animals were abundant.

Analysis of the blood meals taken by *G. morsitans* elsewhere in the Sebungwe area showed that warthog, bushpig, kudu and bushbuck were the principal hosts of the fly. Subsequent analyses from flies caught within the Nagupande drainage area have confirmed this view. It seemed likely therefore that if these species were eliminated quickly from the area the fly would be living at a distinct disadvantage. In order to use every possible method of relieving the pressure of fly on the Shangani-Gwaai cattle areas it was decided to remove these species from the fenced area by shooting. As a preliminary, to preserve the fences and so to prevent ingress of game to the shooting area, elephant and buffalo were driven out before the fence was finally closed. Licensed hunters were admitted in the initial stages, followed by European officers of the Departments of National Parks, Wild Life Conservation and of this Branch. By November 1962, 44 of the 45 elephant had been killed. The remaining one was killed in August 1963. The buffalo also responded quickly to the shooting. The large herds which used to roam through the area have shown no inclination to return. A few, never more than six per month, were shot through the wet season. Three specially trained Africans armed with .425 rifles assisted the European field officer in hunting these animals. To intensify the drive on the four selected species certain water holes were made unpalatable by spraying with diesel oil, causing the game to concentrate on others; a game drive was organized and holes in the ground which might be used by warthog sows for farrowing were blocked up.

Other species which occur within the area but which are unmolested are roan, sable, impala, reedbuck, duiker, grysbok, baboon and four rhinoceros. The latter pose a problem since it is likely that they are providing a constant source of food for the fly resident within their feeding grounds. Negotiations are in progress with the Departments of National Parks and Wild Life Conservation to have these animals removed to Wankie Game Reserve. The delimiting fence is patrolled by armed guards who shoot animals found on the fence line.

Special attention has been given to the collection of scientific data. The area is constantly patrolled to collect blood meals from recently fed flies. These blood meals are sent to the Lister Institute for identification. So far, 3,183 blood meals have been collected, but only those for the period 22.10.62 to 21.12.62 have been tested and identified. They show that warthog and bushpig provide most of the food, and that of the antelope, almost all is supplied by kudu and bushbuck. Of 949 blood meals examined, only one came from a roan and one from an impala. The blood meals collected later in the operation may reflect a change of host. These results are awaited. Dr. B. Weitz of the Lister Institute recently paid a short visit to this country, and was shown over the operations area. He was impressed with the value of the experiment and undertook to make every effort to have the remaining blood meals analyzed at an early date.

In addition to the Department's Veterinary Research Officers, a mammalogist from the National Museums and a worker from the London School of Tropical Medicine collaborated in the collection of material for studies in haematology, serology, parasitology and population behaviour of game animals. A large, perhaps unique collection of skulls, skins and viscera of these animals has been made for future studies. Much of this material has been sent to major research organizations for examination by specialists. Table 3 summarizes the number of animals killed in these operations.

TABLE 3: ANIMALS SHOT IN THE NAGUPANDE SHOOTING EXPERIMENT 1962-63.

	1962			1963										
Species	*October*	*November*	*December*	*January*	*February*	*March*	*April*	*May*	*June*	*July*	*August*	*September*	*Total*	
Elephant	35	9	—	—	—	—	—	—	—	—	1	—	45	
Buffalo	—	2	1	1	6	5	1	2	3	—	—	—	21	
Kudu	20	29	16	16	10	6	6	16	13	16	6	5	159	
Bushbuck	9	6	4	—	—	—	1	1	2	1	—	3	27	
Warthog	218	302	90	123	89	52	78	102	85	81	41	28	1,289	
Bushpig	18	13	1	7	5	7	1	9	10	3	2	3	79	
Eland	1	1	1	—	—	—	—	1	—	—	—	—	4	*Animals shot on fence protection.*
Roan	1	1	—	2	1	—	—	—	—	—	2	—	7	
Sable	3	5	—	—	—	—	1	—	—	—	—	—	9	
Zebra	1	1	—	2	—	—	1	—	—	—	—	—	5	
Tsessebe	1	—	—	—	—	—	—	—	—	—	2	—	3	
Reedbuck	4	—	—	—	1	—	—	—	—	—	—	—	5	
TOTAL	311	369	113	151	112	70	89	131	113	101	54	39	1,653	

Of 1,653 animals killed, 1,289 were warthog, 159 were kudu, 79 were bushpig and 27 bushbuck. Although special attention continues to be given to warthog the numbers killed have dropped from 302 in November 1962 to 28 in September 1963. There is every reason to believe that the warthog population is being eliminated from the fenced shooting area.

The effect of this operation on the tsetse has been measured in terms of catches of *G. morsitans* on bicycle flyrounds, ox patrols and on patrols specifically made to collect blood meals from tsetse flies. Captures from areas outside the shooting area are used as controls.

Figure 4 shows the decline in captures on the flyrounds associated with these operations.

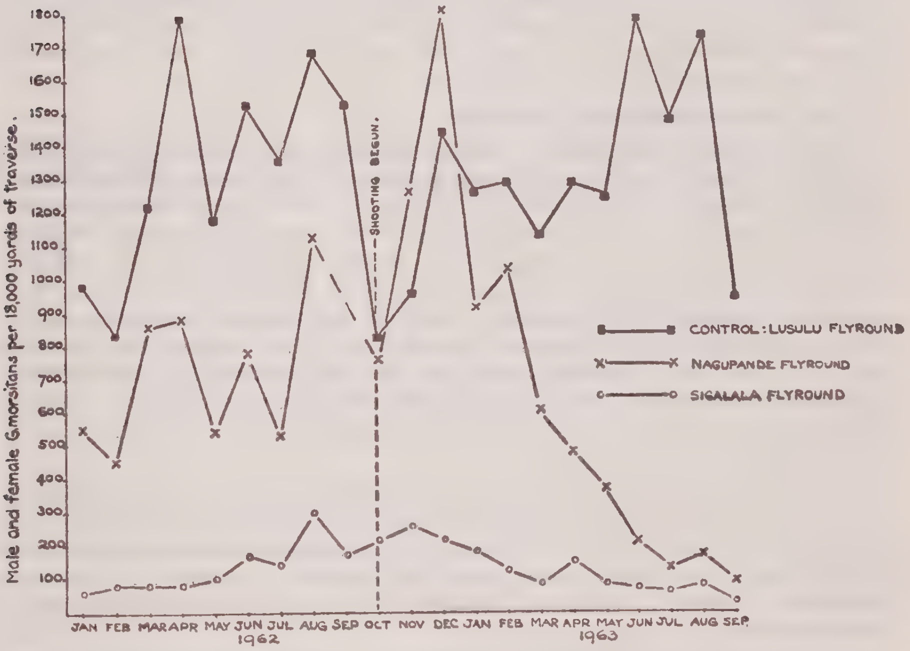


Figure 4

Flyrounds conducted at Lusulu with the aid of bait oxen have been taken as a control. A seasonal maximum in catch is shown for the late wet season March to May 1962 and for the dry season August and September 1962. During 1963 catches increased fairly steadily from January to August. The catch for September dropped, for reasons which are not yet clear. A striking difference is shown by catches on the Nagupande and Sigalala ox flyrounds within the shooting area after the operations began. The seasonal maximum occurred on the Nagupande flyround in March and April 1962 and thereafter increased to a peak in December, two months after the introduction of shooting operations. The decline in catches during 1963 was dramatic. The Sigalala ox round catches show a progressive increase to August 1962. The catch dropped in September but showed a recovery to November. Since then the catches, apart from that of April 1963, have fallen away steadily. The most significant catches will be those from October to December 1963, when the control catches are expected to increase. If no corresponding increase is seen on the Nagupande and Sigalala flyrounds, it may be assumed that the control operation has exercised an effect on the catch. Fewer tsetse flies are now being caught that show evidence of having recently fed. This may be taken as evidence that meals are harder to get and that the population is experiencing difficulties.

RESEARCH

(a) TRYPANOSOMIASIS

1. Salisbury Laboratory

The isolation and storage of field strains of trypanosomes for future study is continuing. The method in general use involves storage at −70°C in a solid carbon dioxide/alcohol mixture. Infected blood is collected in tubes with close fitting plastic caps and cooled to 4°C as quickly as possible after the sample has been taken. The tubes are then placed directly into the alcohol. It was found that this method had several defects. The trypanosome death rate was high. The plastic caps became hard and brittle at −70°C and came off the tubes, allowing alcohol to enter and ruin the contents. Many of the plastic caps showed a manufacturing defect which resulted in leakage. The method is expensive and difficult to maintain since the solid carbon dioxide has to be transported from Northern Rhodesia. An interruption in supplies could result in the death of the strains.

It therefore seemed advisable to investigate an alternative method of storage, using locally available liquid nitrogen in specially designed containers. This method is widely used for storing bovine semen. Initial trials with this technique gave a trypanosome survival rate of 86 per cent., and all *T. vivax* and *T. congolense* strains were infective for cattle after one week's storage.

The trypanosomes now maintained are:

Eighteen polymorphic strains in albino rats, from various game animals killed in a game elimination experiment, three strains of *T. rhodesiense* from humans who became infected in the Zambezi Valley, three *T. brucei* canine strains and one mixed *T. brucei*/*T. congolense*. One *T. simiae* was preserved from a pig. A strain of *T. congolense* drug fast to antrycide and another to Homidium are available, and a bovine strain and an ovine strain of *T. vivax*. A strain, so far unidentified but showing affinities with *T. congolense* is under investigation. This monomorphic strain produces an acute disease in domestic pigs, killing in five days from the time of sub-inoculation. Bovines, guinea pigs, rats and rabbits have proved refractory to this strain. Three sub-passages in the definitive host failed to produce polymorphism though the mean length of the trypanosome increased from 13.41 to 15.80 microns.

Various field strains of trypanosomes have been the object of biometric studies. Thirteen strains of *T. vivax* showed a mean length within the range of that described by Fairbairn for the East African type, which produces the more chronic disease. Sixteen strains of *T. congolense* from Southern Rhodesia and one from Kingolwira, Tanganyika have been measured. Most of the strains are of the dimorphon type.

Twelve strains of *T. simiae* were measured. One strain of *T. theileri* from Bromley, Southern Rhodesia, which showed an unusual pathogenicity gave a mean length of 43 microns, which is considerably shorter than the quoted mean length for this species.

The trypanocidal effect and tolerance of a new drug is under test. It was found to be lethal to trypanosomes but changes in its formulation would seem to be desirable. Further tests are to be conducted on variations of the drug. The $C.D._{50}$ and $L.D._{50}$ for various drugs are being established in the Branch's strains of albino rats as a preliminary to studies on the comparative effects of various trypanocides.

A continuous syringe passage in rats of a strain of *T. congolense* found to be resistant to Homidium has begun, to record the physiological and morphological changes that occur.

The veterinary officer appointed in April to this Branch had previously received specialized training at the Rowatt Institute, the Royal Dick Veterinary College and the Medical School of Aberdeen University in basic techniques of fluorescent protein tracing and electrophoresis. His knowledge is being applied to the study of the properties of the blood of game animals which render them immune to trypanosomiasis. Sufficient material is becoming available to warrant the attention of an immunologist to elucidate this fascinating and economically important problem of immunity in game and cattle.

The maintenance of the growing colony of albino rats and rabbits presented management problems. An outbreak of a chronic pulmonary infection in rats was overcome, and of notoedric mange in rabbits.

A large number of blood smears submitted by district veterinary officers was examined.

Short courses of instruction were given to ten European and five African lay staff.

2. LUSULU EXPERIMENTAL STATION

The station is still in the development stage. The ranch has been divided into four areas, each of which has been sub-divided into five, to allow of a system of fire control and veld management. Unfortunately, two fires recently destroyed most of the grazing in the north-east area.

Small plots of sugar cane, melons and lucerne have been grown to produce supplementary feed.

There are at present 151 head of stock on the station of which 73 were purchased during the year. The calving rate was extremely low, with only six live births. The bulls suffered from various ailments, and have now been replaced with better material.

Anaplasmosis caused 17 deaths. Response to treatment was poor, due, it is believed, to the aged condition of the animals involved. Acute vegetable poisoning caused the death of 12 animals, of which seven were from a recently purchased herd. These died within 36 hours of their introduction.

(1) *Experiments with Cattle*

The drug trials commented upon in earlier reports continued. Resistance to antrycide and ethidium was suspected late in 1962, and confirmed in May 1963. This situation was dealt with by constructing a new kraal in the north-east area of the ranch and introducing there a newly purchased herd. It was hoped by this means to confine the resistant strain or strains to the headquarters and Busi River paddocks, but by May it was found that resistance had also developed in the new herd.

Experience of the reaction of oxen used on fly patrols to prolonged drug treatment suggested that a tolerance to the trypanosome could develop. This phenomenon had also been observed in sheep and to same extent in pigs. To confirm this observation a group of cattle that had received continuous ethidium bromide treatment for 18 months were, from December 1962, given individual treatment with this drug, only on the appearance of clinical symptoms. The intervals between the December 1962 treatment and the appearance of symptoms were, for each animal, 196, 206, 225 and 311 days respectively in face of heavy trypanosome challenge. The development of resistance to the disease was thus clearly demonstrated.

The appearance in the stock of *T. congolense* resistant to antrycide, ethidium and berenil put an end to the experiment. All stock on the ranch were treated with iso-metamidium which eliminated the disease. Animals will be kept on this drug administered at three-monthly intervals for a year to prevent its perpetuation in the cattle, in the event of its having infected the local tsetse flies.

A most striking instance of tolerance to trypanosomiasis is shown by two bait oxen used at Rekomitjie for making routine catches of tsetse flies. In this area of the Zambezi Valley, an ox would receive an average of four infected bites per hour. At one limited period they were receiving bites from 200 feeding flies per day. They had been maintained on regular monthly injections of antrycide pro-salt for approximately two and a half years, when the treatment was suspended, to be replaced with injections only when clinical symptoms appeared. These animals have now continued for over two and a half years without treatment, and without showing clinical symptoms, though occasional parasitaemia has appeared. Their condition has remained excellent throughout the period.

(2) *Experiment with Sheep*

The sheep on the station are maintaining condition. Three of the four rams were found to be sterile as a result of advanced brucellosis. The fourth died from trypanosomiasis.

The Black Head Persians and the indigenous animals originating from the Sabi River area exhibited a high resistance to trypanosomiasis. A low parasitaemia persisted in the absence of clinical symptoms in which positive blood smears would be followed by periods when parasites could not be detected. Of 580 blood smears taken at weekly intervals during the year, 424 were positive. Fourteen animals died from trypanosomiasis. It became evident that these sheep had developed a high resistance to trypanosomiasis in this area of high trypanosome challenge, but that at times in some animals, this state of premunition broke down, and an acute crisis supervened ending in death within a week in the absence of treatment. Timely treatment with berenil was followed invariably with disappearance of trypanosomes from the blood, and clinical recovery. If an animal had been allowed to reach a state of collapse, however, death often followed, despite treatment.

The indications are that sheep can be maintained on a three-monthly treatment with berenil. Such a trial will be undertaken during 1963/64 and the breeding and growth rate of younger stock will be recorded.

The opinion has been confirmed that sheep, because of their manifest resistance to trypanosomiasis, might play a greater part in stocking tsetse-infested areas.

(3) *Experiment with Pigs*

The small herd of pigs was supplemented by four stores from Salisbury. A litter of nine, farrowed and reared on the Station made satisfactory weight gains. The number became in excess of requirements, and the surplus were disposed of. The remainder are in excellent clinical condition, but no further breeding has taken place, although one mature sow appears to be pregnant.

Monthly doses of antrycide pro-salt (old formula) at 20 mgm. per kilogram was found not to give protection against *T. simiae*. Five out of six pigs treated were positive one month after treatment. They were treated again with 30 mgm. per kilogram and trypanosomes disappeared from the blood, but reappeared in five out of six cases within 21 days after treatment. All showed parasitaemia within 30 days. Four of these animals were treated again, and two were left untreated, as controls to illustrate any subsequent changes in resistance.

One of the controls showed absence of parasites for two weeks, but declined in condition. Treatment was given after 31 days and the condition improved. The other remained in good health, and was treated as an experimental animal. The animals were then treated individually as they exhibited signs of the disease. The intervals between or since treatments for the five animals have been (1) 53 days, 8 days and more than 58 days; (2) more than 104 days; (3) more than 121 days; (4) more than 121 days; (5) more than 154 days. A state of premunition thus appears to have arisen in these pigs following drug treatment. An untreated pig introduced to the herd during the period of the experiment died within 21 days from an acute *T. simiae* infection.

3. CHARARA STATION: KARIBA

A group of 20 cows, four young calves and a bull are being kept in satisfactory condition at Charara under high trypanosome risk with constant use of trypanocidal drugs. Examinations carried out during June showed that ten cows were in calf. Of the remaining ten, four had unweaned calves in attendance, three were less than 18 months old and one was sterile. It has thus been demonstrated that a high trypanosome challenge and constant use of drugs need not prevent a good calving rate.

(b) TSETSE FLY

1. REKOMITJIE RESEARCH STATION

The training of Field Assistants continued throughout the year. They are instructed in recognition of the various species of tsetse flies, of their physiological condition and in fly round techniques. Later the more efficient are selected to assist in investigational work involving collection of blood meals from flies, marking flies for identification with oil paints according to a code and dissection of flies to determine the degree of infection with trypanosomes.

The experiment to investigate the relationship between *G. morsitans* and the game animals on which they feed and the trypanosomes in both host and fly was described in the last Report. This experiment continued throughout the year, but the data have not yet been analysed. Initial results of analyses of blood meals and of the trypanosome infection rate of the flies from two distinct habitats suggest that the different pattern of food hosts in the two areas may be producing a different rate of trypanosome infection in the flies. In the riverine area, approximately 17 per cent. of the flies dissected were infected with trypanosomes, and 43 per cent. of the blood meals collected were from bovids (of which 32 per cent. were from kudu and bushbuck). Bush-pig and warthog represented 35 per cent. of the meals.

In the mopane woodland area, 14 per cent. of the dissected flies were infected. The blood meal analyses showed that 55 per cent. were from warthog and bushpig and 25 per cent. from bovids (of which bushbuck and kudu supplied 17 per cent.). Records from East Africa and Moçambique indicate that 30 per cent. to 45 per cent. of kudu and bushbuck are infected with trypanosomes, and 10 per cent. to 14 per cent. warthogs and bushpigs. If this same disparity occurs in this country, the difference in infection rates of *G. morsitans* from the two sampling areas, although not great, might be accounted for by the differences in their feeding patterns.

An experiment was carried out near Kariba on the Kariba power line, to determine the effect of a sheer cleared barrier 150 yards wide in limiting the movement of *G. morsitans* and *G. pallidipes* across it. The clearing extends far beyond the fly habitat, so that flies marked on one side of the clearing and found on the other could not have avoided crossing it. Captures of marked flies indicated that both species were able to cross the clearing. Records of spoor of game animals were made, but there was no indication that game movements had influenced the recaptures of marked flies.

It remains to be seen whether treatment of the edges of the clearing with a persistent insecticide would make the clearing more effective as a barrier to fly.

2. Lusulu Station

Investigations into the behaviour patterns of *G. morsitans* within different ecological situations continue. Not as much is known of the behaviour of the female fly as of the male, but it is becoming evident from observations made at Lusulu that the female ranges further afield than the male during the hot, dry season, and that the Branch's methods of application of insecticide may need to be modified accordingly.

3. Kariba

An island in Kariba Lake, near the Bumi Hills, was selected as the site of an experiment to investigate the tsetse fly/host/habitat relationships under special conditions. It was first necessary to decide whether *G. morsitans* could survive through a dry season in the presence of host animals but in the absence of typical dry season habitat. In August, 6,500 *G. morsitans* pupae were planted to supplement the local population. The island will be revisited in November to determine whether fly has survived.

HUMAN TRYPANOSOMIASIS

One case of human trypanosomiasis was recorded under circumstances which suggest that it was contracted in the Gache Gache/Sanyati area of the Kariba Lake shore.

MAPPING

Detail derived from ground surveys is constantly being added to existing maps. Work is in progress on the production of a series of maps at a scale of 1 : 100,000 for all tsetse areas in Southern Rhodesia.

The Lusulu Ranch was mapped at a scale of 1 : 20,000, showing the vegetation types.

Surveys, including the accurate plotting of dip tanks and kraals, were carried out in tsetse areas in Sabi East, Nuanetsi and Limpopo rivers, Miami Crown lands and Vuti Block, Sanyati Reserve and Chenjiri Native Purchase Area.

The Survey Ecologist assisted the Department of Lands and the Ministry of Internal Affairs in defining boundaries of development areas and paddocks and in pegging access routes in these areas.

SURVEY OPERATIONS

Information on the changes in distribution and in numbers of a tsetse population is obtained from captures made on foot patrols made with or without the aid of bait oxen, or on bicycle patrols, over predetermined routes within various tsetse habitats. At set intervals of distance, stops are made to catch flies which have been attracted. The data supplied by these patrols throw light on the seasonal variations in tsetse fly numbers, in their seasonal distribution and on the effect of control measures that have operated in the area. They are an integral part of any control operation.

There are 10 foot patrols, 48 bait ox patrols and 158 bicycle patrols operating at present.

Another source of information is provided by test herds of cattle. There are seven herds distributed in areas where the fly population is low and catches are rare. The appearance of trypanosomiasis in these herds indicates the probable presence of fly in the vicinity. Animals developing the disease are treated with berenil, which cures them, but which, as it provides little or no prophylaxis, leaves them available for reinfection within one or two days.

ROADS

The extension of survey operations and the mounting of spraying operations involve extensive road and track-building operations. Use is made of tractor-mounted disc ploughs to make and maintain these tracks. Some 970 miles of roads and tracks are being maintained.

FENCES

Two hundred and forty miles of game fences are being maintained and 100 miles of cattle fences. Game fences, which cost on an average, £130 per mile to erect, cost £12 per mile per year to maintain. Cattle fences cost £2 8s. per mile per year to maintain.

BUILDINGS

Three field officers' quarters are under construction at Lusulu, Cewali and Mtoko, and the house at Rekomitjie has been renovated.

ACKNOWLEDGEMENTS

The year has again been marked by close collaboration with many departments, both Federal and Territorial, special mention being due to the Ministry of Internal Affairs and to the Departments of Wild Life Conservation, Lands, Printing and Stationery and Federal Surveys. Thanks are also due to research workers of the Agricultural Research Council and of the University College of Rhodesia and Nyasaland for advice on a number of occasions.

The support of the staff of all Branches of the Department has been of a high order, despite many difficulties outside their control, and they are to be complimented on a year of sound achievement.

J. MACKINNON,
Director of Veterinary Services.

APPENDIX 1

CATTLE AT RISK, SMEARS, INFECTIONS AND TREATMENTS: BY DISTRICTS

District	1962 Cattle	1963 Cattle	Smears	Infections *T. congolense*	 *T. vivax*	 *Mixed or Other*	 *Total*	Treatments *Antrycide D.M.S.*	 *Antrycide Pro-salt*	 *Homidium*	 *Berenil*	 *Iso-Metamidium*	 *Total Treatments*
Binga	5,554	6,425	5,314	46	19	3	68	4,615	6,181	—	52	2,752	13,600
Lupane	9,648	9,832	10,626	81	48	—	129	35	—	1,557	2,313	—	3,905
Gokwe	14,589	15,215	6,741	366	63	4	433	7,135	12,497	—	2,952	2,607	25,191
Urungwe	3,022	4,203	1,372	88	22	—	110	—	—	—	437	—	437
Darwin	6,050	13,572	843	96	24	—	120	—	1,485	—	1,629	—	3,114
Mtoko	6,467	12,568	3,125	316	78	11	405	86	—	975	5,448	—	6,509
Inyanga	13,608	13,795	3,085	233	24	—	257	—	3,445	10,478	7,129	1,243	22,295
Chipinga	26,190	28,034	7,008	690	178	20	888	52	—	—	1,965	—	2,017
Ndanga	9,056	8,928	2,825	15	192	3	210	2,004	—	—	454	—	2,458
Bikita	3,929	3,465	150	—	2	—	2	2	—	—	—	—	2
Nuanetsi	2,323	7,739	959	32	138	3	173	5,751	—	—	2,310	—	8,061
TOTAL	100,436	123,776	42,048	1,968	793	44*	2,795	19,680	23,608	13,010	24,689	6,602	87,589

* Includes 10 *T. brucei* and 2 *T. simiae*

APPENDIX II

SMEARS, POSITIVES AND INOCULATIONS, 1955 to 1963

Year	*No of Smears*	*No. of Positives*	*Per cent. Positives of total Smears*	*Inoculations*
1955-6	23,028	198	0.9	47,126
1956-7	27,982	422	1.5	61,561
1957-8	28,334	578	2.0	69,505
1958-9	38,734	930	2.4	91,421
1959-60	51,005	1,398	2.7	115,773
1960-1	35,714	1,307	3.7	82,260
1961-2	36,892	1.614	4.4	99.284
1962-3	42,038	2,795	6.5	87,589

APPENDIX III

TRAFFIC CONTROL RETURNS 1962-63

DISTRICT		CARS				CYCLES				PEDESTRIANS			
		No.	*Male*	*Female*	*Total*	*No.*	*Male*	*Female*	*Total*	*No.*	*Male*	*Female*	*Total*
Sebungwe	m	6,359	6,700	2,969	9,669	15,409	26,660	11,692	38,352	17,754	11,169	5,129	16,298
	p		1	—	1		—	—	—		2	—	2 *
Gokwe-Sanyati	m	2,525	6	8	14	5,515	40	15	55	5,277	13	8	21
Urungwe	m	193,474	2,187	1,464	3,651	15,710	1,181	783	1,964	34,914	1,276	959	2,235
	p		1	—	1		—	—	—		1	1	2
N. Lomagundi	m		—	—	—	183	6	3	9	345	—	—	— †
N. Sipolilo	m	85	—	1	1	268	6	3	9	226	—	—	—
Sabi East	m	353	1	1	2	7,361	98	46	144	44,203	153	100	253
	p		—	—	—		—	—	—		14	10	24
Sabi West	m	2,740	226	81	307	5,187	242	112	354	7,536	166	68	234
South Lundi	m	1.315	246	105	351	3,014	2,170	597	2,767	6.180	2,257	575	2,832
	p		—	—	—		—	—	—	—	1	—	1
Mtoko	m	10,942	16	6	22	1,197	36	12	48	1,221	6	1	7
TOTAL	m	217.598	9,382	4,635	14,017	53,844	30,439	13,263	43,702	117,656	15,040	6,840	21,880
	p		2	—	2		—	—	—		18	11	29 *

m = *G. morsitans.* p. = *G. pallidipes.*

* Plus one male specimen, details unknown.

† Records since May 1963.

Flies per 100 cars, 6.44; Flies per 100 cycles, 81.01; Flies per 100 pedestrians, 18.60.

APPENDIX IV

RATES OF CATCH OF *G. MORSITANS* PER UNIT CARRIER AT DEFLYING POINTS, 1955-63

Year	*Cars.*	*G. morsitans*	*G. morsitans per 100 cars*	*Cycles*	*G. morsitans*	*G. morsitans per 100 cycles*	*Pedestrians*	*G. morsitans*	*G. morsitans per 100 pedestrians*
1955-1956	183,108	2,633	1.44	109,596	3,205	2.76	174,608	1,683	0.96
1956-1957	181,902	3,666	2.02	134,358	4,094	3.05	218,561	3.092	1.79
1957-1958	195,734	1,554	0.79	141,817	3,392	2.39	265,647	3,338	1.26
1958-1959	203,861	1,264	0.62	87,167	4,542	5.21	207,106	2,778	1.34
1959-1960	153,950	1,006	0.65	47,865	5,104	10.66	131,473	2,268	1.73
1960-1961	167,097	883	1.46	49,978	10,900	21.81	129,471	2,620	2.02
1961-1962	226,841	4,826	2.13	43,500	14,724	33.85	106,397	6,465	6.08
1962-1963	217,598	14,017	6.44	53,844	43,702	81.01	117,656	21,880	18.60